Hand Made Hand Tools

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A WORD from the author

Hand Made Hand Tools was compiled from articles written between the years 1890 and 1948. My continuing research into old magazines and books of this period, and the Lost Data Press publishing program based on that research, is my attempt to help people in the United States and other parts of the world rediscover the excitement of invention and understanding which is expressed by the articles in this book. Reading these articles will help you understand the working principles of basic tools, explain modifications for your special problems, and perhaps stimulate new invention for new circumstances. You may also gain new freedom from time and money worries by making and repairing your own tools and projects.
Always keep in mind:

SAFETY FIRST!

The limb you save may be your own!

Remember
that all the instructions and methods in this book date from a period before printed safety warnings.
These ideas came from people and are for people who are used to the equipment necessary to do-for-yourself.
THINK for yourself, too.
THINK SAFE.

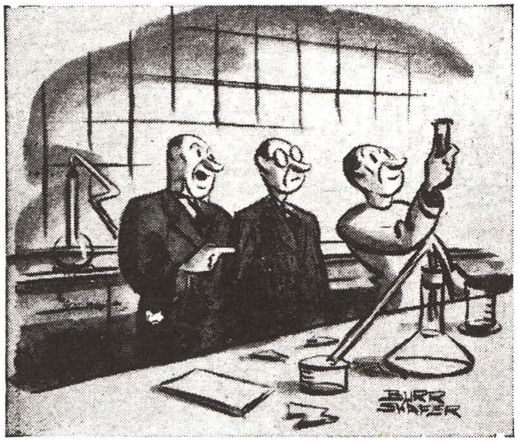
Lost Data Press is soon to publish more related material in 3 forthcoming books:
A 2-volume mathematical reference book which deals with simple addition through trigonometry and includes conversion charts for mechanical, electrical, and physical problems. Anyone will be able to understand and use this book.

Hand Made Power Tools: similar in size and concept to Hand Made Hand Tools, with the same preference for simplicity, usefulness, and invention.

Remember:
If you can't get the propeller
off of the shaft,

Try
getting the shaft
out of
the propeller.

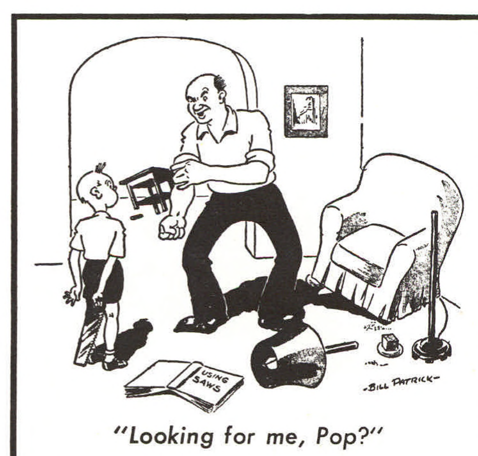
In the hopes of a bright future,
Keith W. Daniels
Lost Data Press
April, 1979



"Mr. Hotchkiss has developed a new transparent plastic that shatters just like glass."

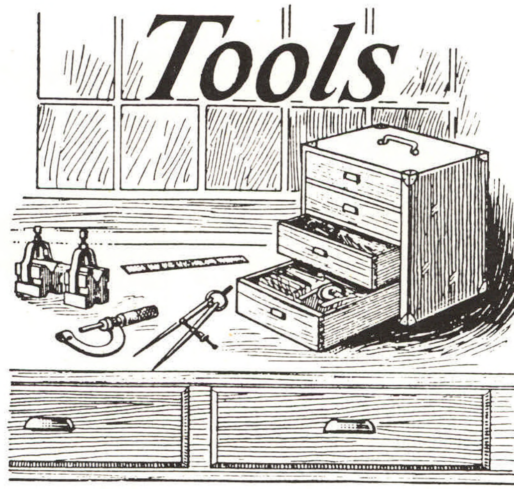
"Down in the basement is my husband's workshop—I think he's making a boat."

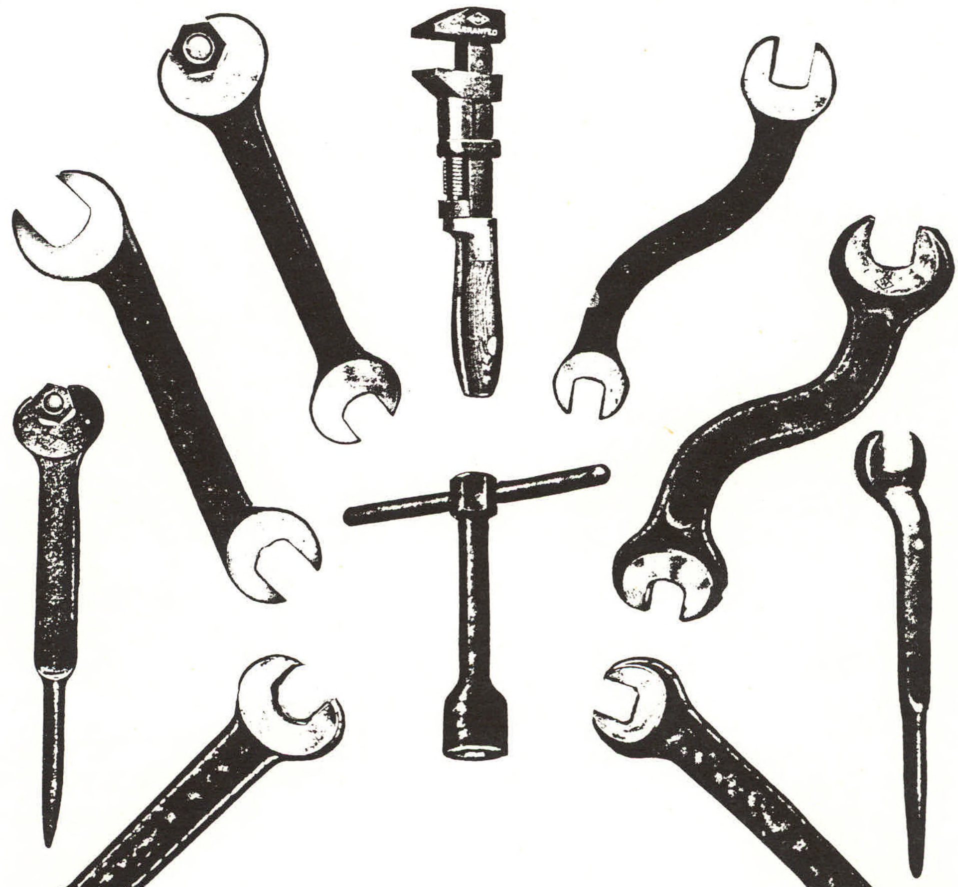
"Clarence went away and left his lathe running again, I see."



"Looking for me, Pop?"

The Quickest Easiest Way

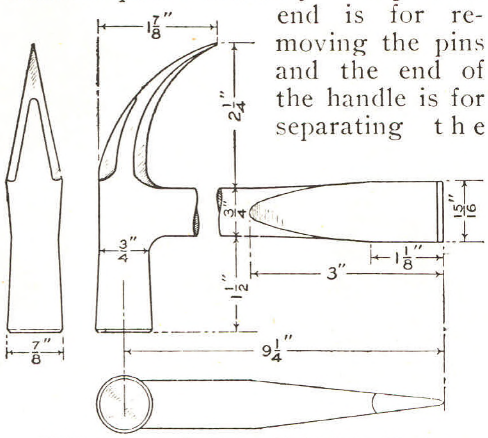




YOUR brains and skill are as much capital as money, so make the best of them.

Hammer for Handling Cotters

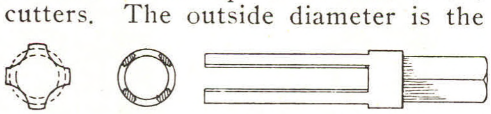
Where there are numerous cotters to remove or replace, the hammer illustrated is quite a necessity. The pointed end is for removing the pins and the end of the handle is for separating the legs after driving the cotter in place. It is constructed entirely of metal.—Contributed by Joseph K. Long, Renovo, Pa.



Hammer Made Entirely of Metal for Placing, Removing, and Fastening Cotters

A Broken-Tap Extractor

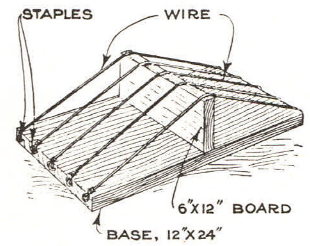
A broken tap that is tightly wedged in the metal cannot be easily removed and sometimes even a hammer and chisel will not start it from the hole. The device illustrated can be depended upon to remove the most stubborn broken tap. The device is made of a selected piece of steel, in which a hole is bored centrally equal in diameter to the size of the tap at the base of the cutters. The outside diameter is the same as that of the drill size for the hole being tapped. The hollow part of the tool is then slotted to make four prongs that will slip into the flutes of the tap. When a tap is broken and a part of it remains in the hole the prongs of the tool are slipped into the flutes and the part removed by turning it.—Contributed by Lawrence Annette, Port Huron, Mich.



The Prongs of the Tool are Slipped into the Flutes of the Tap for Removing It

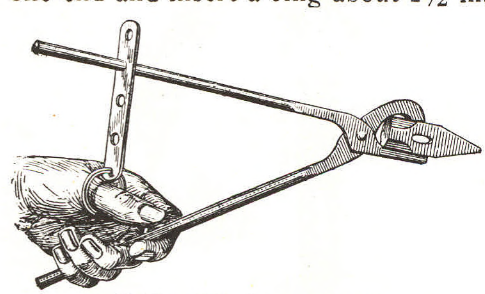
A Wire Boot Scraper

A most efficient boot scraper can be made from two boards and a few feet of strong wire. A T-shaped support is made by nailing the two boards at right angles to each other. The upper edge of the perpendicular board is notched to keep the several wires from shifting their positions. One end of each wire is fastened to one end of the horizontal board with staples, the wires being then drawn up tightly across the vertical support and made fast with staples to the opposite end of the base. When the foot is drawn across the taut wires, the mud is scraped off and falls onto the base.



Adjustable Handle Link for Blacksmiths' Tongs

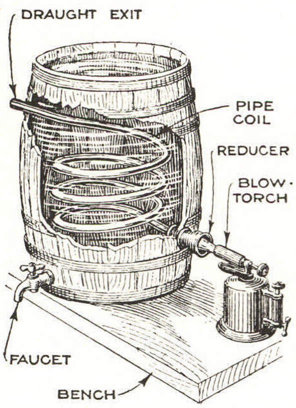
Some blacksmiths cannot afford to have a full line of tongs and the device shown in the illustration was designed to be used where the handles of the tongs spread beyond the grasp of the workman's hand in holding various kinds of work in the jaws. It is made of a piece of flat iron, 1/4 by 1 in. and 6 in. long. Drill a 3/8-in. hole in one end and insert a ring about 1 1/2 in. inside diameter. Beginning at the other end, drill four holes, each slightly smaller than the handle of the tongs. File the handle tapering so as to make a wedge fit when it is put in a hole. This will keep the device from coming loose when the tongs are thrown down.—Contributed by M. Kakara, Streator, Illinois.



Holding Wide-Spread Handles

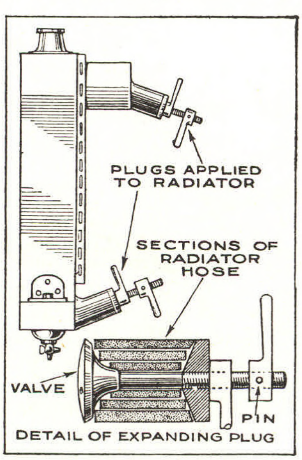
Heating Water with a Blowtorch

The drawing shows how a barrel of water can be heated with a blowtorch to furnish warm water for the shop, or, in cold weather, for watering stock, mixing cement, and similar purposes. A coil of $1\frac{1}{2}$-in. pipe is inserted into the barrel, the lower end being provided with a flange and reducer. The flange is placed on the inside of the barrel and packed to prevent leakage past the pipe, and the reducer is screwed onto the outside end, forming a funnel-shaped opening for the flame from the blowtorch. With the tip of the torch burner about an inch from the coil, the flame will be thrown into the pipe, and the hot air carried upward to the outlet will speedily heat the water.



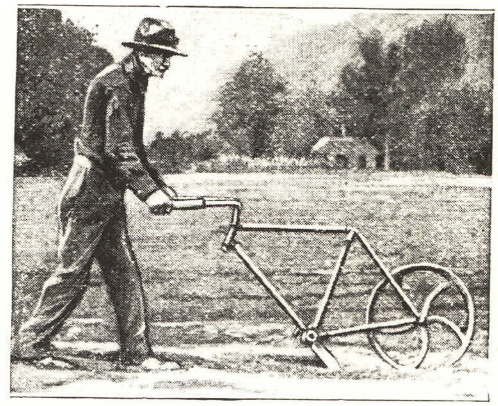
Plugs for Radiator Testing

Old automobile valves are utilized for the essential parts of the automobile-radiator testing plugs shown in the drawing. The end of the stem is threaded and two threaded handles and a conical washer are provided. In assembling the plugs, a number of sections of heavy rubber tubing of different diameters are slipped over the valve stem, the conical washer applied, and then the two handles, one of which is pinned rigidly to the valve stem, as shown. In use, the plugs are inserted into the openings of the radiator headers and the handle screwed down; this forces the sections of rubber tubing against the valve head and conical washer, causing the rubber to expand and completely fill the opening, so that the radiator can be tested for leaks.



Hand Plow Rigged in Bicycle Frame

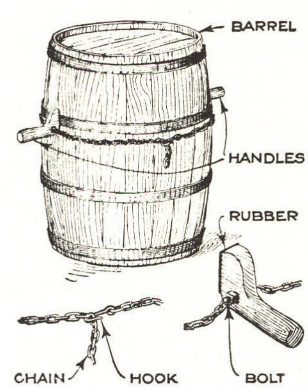
An old bicycle frame was easily converted into a substantial frame for a hand plow, as shown in the photograph, the handlebars being reversed, and used as plow handles. An old iron wheel was fitted into the frame where the rear wheel formerly was set, and the plowshare, shaped from a section of an old shovel, was bolted to the hub at the usual crankshaft bearing. A U-bolt of round iron was used for this purpose.—Robert W. Phelps, Los Angeles, Calif.



This Hand Plow was Rigged Up from an Old Bicycle Frame, an Iron Wheel, and a Section of a Shovel for the Plowshare

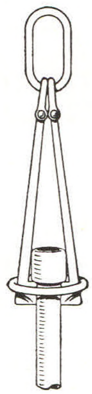
Detachable Handles for Barrels

Where barrels and kegs that must be kept in an upright position are to be handled, the detachable handles illustrated simplify the difficult matter of getting a convenient hold on the barrels when handled in the usual manner. Two rubber-faced hardwood handles of the shape shown in the drawing are provided, and a suitable length of $\frac{1}{4}$-in. link chain is fastened to each side of both handles. On the ends of two of the chains grab hooks are provided that will hook into any link of the chain. The handles are placed just slightly above the bilge and the chains adjusted to the proper length. As the handles are lifted the action clamps them to the sides of the barrel.



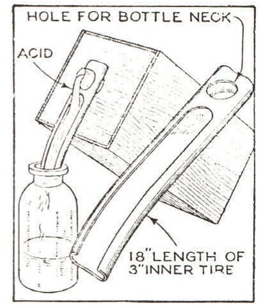
A Tool for Pulling Pipe

The pump repairman repeatedly has use for some kind of pipe pulling device. I have used various kinds, but never handled a safer and better tool than the one I designed myself. This tool I made from two pieces of $1\frac{1}{8}$-in. square iron about 20 in. long, shaped on one end of each so as to fit around the pipe under a coupling. The other ends of the two pieces are drilled and each fitted with a clevis and both clevises connected with a link. Another link is made just large enough to slip over both pieces of iron and hold them close together on the pipe. Several sizes of links should be made to adjust the jaws to the various sizes of pipes.—Contributed by H. Toeffer, Mt. Carroll, Ill.



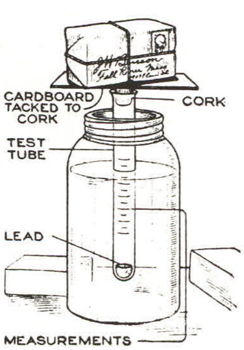
Rubber Trough for Acid Carboys

Acid carboys are bulky and difficult to handle unless they are mounted on some form of pouring device. If no device of this character is available, it is a very difficult matter to pour acid without more or less splashing and spilling, with resulting damage to clothing and surrounding objects. By using a suitable length of automobile inner tube as a trough to guide the acid, all the potential loss and damage can be prevented. A hole is cut into one end of the tube section to fit over the neck of the carboy, and the upper wall is cut away as shown, leaving the sides to guide the fluid into the receiving container.



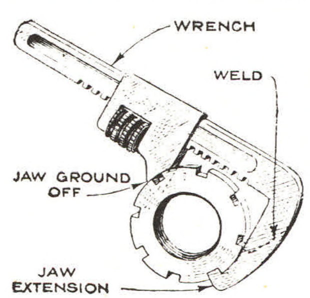
Hydraulic Postal Scales

A chemistry student has made fairly accurate hydraulic scales from a large test tube and a glass fruit jar. In the bottom of the tube was placed a piece of lead sufficient to hold the tube upright when it was set in the jar partly filled with water. A cork, to which was attached a square of cardboard, was inserted in the end of the tube, forming a pan. To calibrate the device, known weights were placed on the cardboard and the various depths to which the tube sunk were marked on its side.—Dale R. Van Horn, North Loup, Neb.



Making an Adjustable Spanner Wrench

A spanner wrench with a fixed jaw opening will only handle slotted lock and gland nuts with a diameter corresponding to the radius of the wrench. An adjustable wrench for nuts of this type can be made from an ordinary monkey wrench by modifying it as shown in the drawing. With such a wrench any size of slotted nut within the limits of the jaw opening can be turned. The wrench used need not be a new one, as the condition of the jaws is unimportant. A piece is welded to the outer jaw and the sliding jaw is ground off at an angle, a stud being driven into the sliding jaw and a hook formed on the outer one to engage with the slots in the nuts. The extension of the outer jaw should be casehardened or tempered to avoid bending and wearing.



A Combination Ladder

A handy and inexpensive ladder for use on a farm, around buildings, or on construction work is shown in the accompanying sketch. The main part is made of 2 by 4-in. material having a suitable length, sawed in two, and provided with one or two heavy strap hinges. A crosspiece, 1 in. thick, 4 in. wide

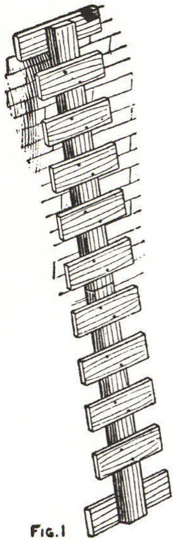


Fig. 1

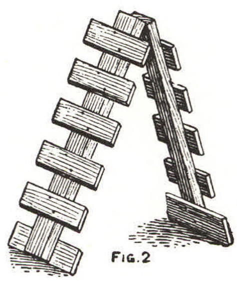


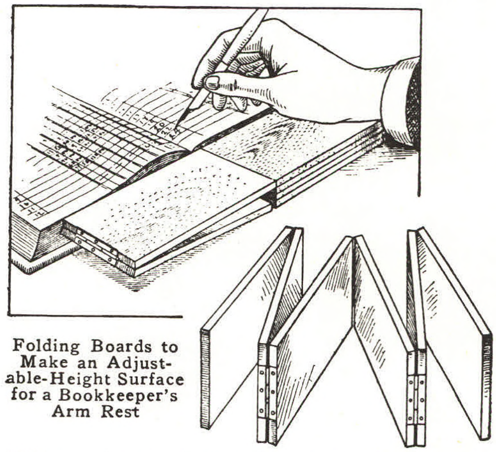
Fig. 2

Ladder and Stepladder

and 3 ft. long, is nailed to the under side of the 2 by 4-in. piece on each end. The steps, which are of 1 by 4-in. material, are nailed on the upper side as shown. The full length ladder may be used as shown in Fig. 1, or made into a stepladder as in Fig. 2.

Hand Rest for Bookkeepers

The one disadvantage of the ordinary arm rest for bookkeepers is that its surface is too low for comfort.

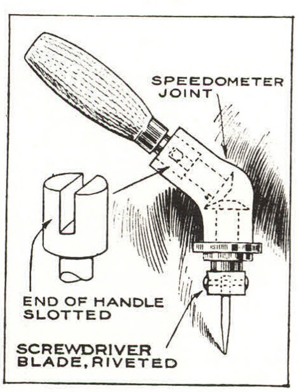


Folding Boards to Make an Adjustable-Height Surface for a Bookkeeper's Arm Rest

When its end is placed between the book pages the rest part is not level with the page on which the entry is to be made. This difficulty is entirely overcome by making a series of thin boards, the width desired for the rest and as long as the book page is wide. These are hinged together at the ends so that they will spread out similar to a hearth screen. It is easy to stack them for the proper height.

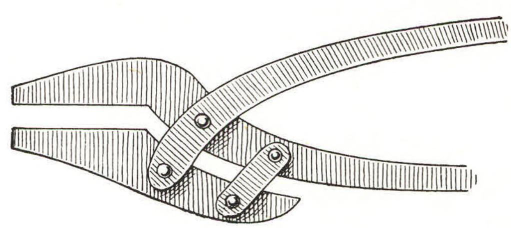
Geared Offset Screwdriver

A screwdriver, for use where the space above the screw head does not permit the application of the usual straight-handle type, is made, as shown in the drawing, from a speedometer joint, in which two bevel gears rotate shafts held at an angle to each other. There are usually two such joints on each speedometer, at the points where the flexible shaft is connected. The joint is modified by riveting a screwdriver blade to one end and fitting a handle to the second shaft, as indicated. In use, the casing about the gears forms a convenient hold for the palm of the left hand, while the right hand is used to turn the handle.



Blacksmith's Parallel Tongs

The ordinary blacksmith's tongs are not constructed so they will grip pieces of various thicknesses and hold

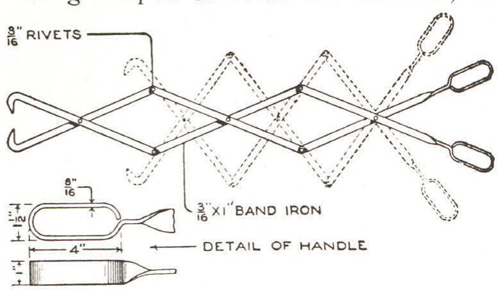


Parallel Jaws

them solidly. The jaws are set so that when opened they will be parallel only at a certain point of separation, thus making it necessary to have a number of tongs about the anvil. The illustration shows a way to make parallel jaws on tongs for holding pieces of various thicknesses. When holding with these tongs, the material held will not turn sideways or slip away from the grip of the jaws.—Contributed by Geo. Newfeld, Philadelphia, Pa.

Tongs for Removing Clinkers from Furnace

The householder who has attempted to remove clinkers from a furnace with a poker will appreciate these homemade tongs for the purpose. They fold compactly when not in use, and are long enough to give the needed protection to the user. They are made of 3/16 by 1-in. band iron, two strips being shaped to form the handles, as

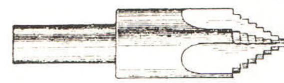


This Substantial Pair of Tongs Is Handy in Removing Clinkers from the Furnace Fire

detailed. The joints are riveted snugly, but with sufficient play.—A. E. West, Detroit, Mich.

An Original Drill for Sheet Metal

The drawing shows an original design in drills for the particular purpose of drilling holes in sheet metal. It is sometimes dangerous to undertake the drilling of very thin sheet-metal stock with an ordinary drill, and the hole that results is generally very ragged. This drill will

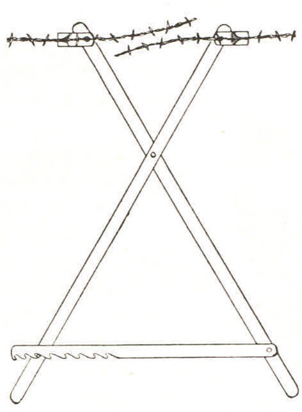


make a hole from 1/8 to 1 in. in diameter, each step advancing in size 1/8 in. It would at first appear that drilling, say a 3/4-in. hole, with this tool would be a slower operation than with a drill of that size, but this is incorrect, as each succeeding step removes the same amount of metal and permits a quick feed.

The steps are formed on the lathe, and are backed off or relieved on the bottom only, after the flutes have been milled or filed to form the cutting edges. The radii of the cutting edges are left as they come from the lathe, thus assuring a smooth even hole. To operate the tool for cutting a hole of a certain diameter, it should be fed through the sheet stock until the desired size is obtained; then, if several holes of the same size are to be drilled, the stop on the drill press should be set for the proper depth.

Splicing a Wire Fence

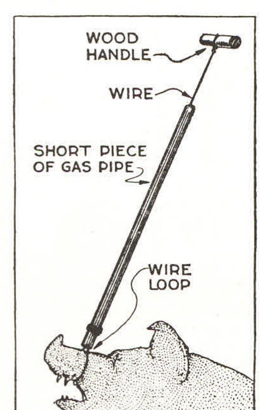
This device shown in the accompanying sketch is very handy for holding the wire of a fence while making a splice. It is made of two hard wood sticks or bars of metal, 3 or 4 ft. long, which are bolted together as in making a pair of tongs. Two small clips are bolted at the shorter ends



of the bars. These are made like a hook to hold the wire. After placing the end of the wires in the clips they are pulled together in the same manner as closing the tongs. The bars are held together while making the splice by a crosspiece fastened to one bar and notched to fit a pin in the other bar.—Contributed by W. C. Parker, Olaf, Iowa.

Snout Snare Makes It Easy to Ring Hogs

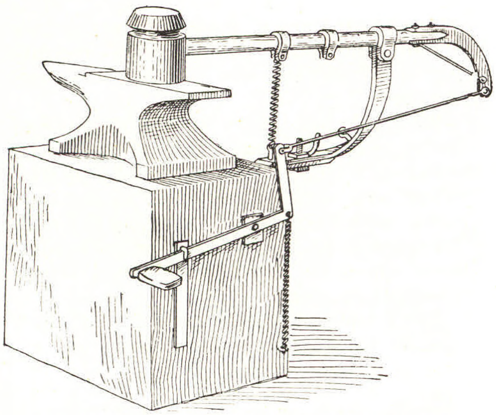
With a piece of old pipe and a loop of wire, one can handle the most vicious hog, prevent it from biting, and easily ring the animal. One end of the wire is firmly bound around a piece of broom handle. The wire is passed through a gas pipe and bent into a loop. This loop is caught on the upper jaw of the animal, and held taut against the



gas pipe by means of the handle. The device may also be used for the purpose of snaring chickens by catching their legs in the loop.

A Foot-Power Hammer

The hammer is fitted with a heavy wood handle to which a curved piece of iron is attached with clamps, and

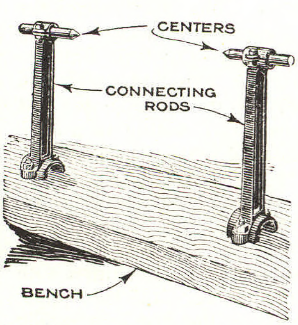


Hammer Attached to Anvil Block

braced with a rod as shown. The yoke at the fulcrum is fastened securely to the handle and also to the bar-iron brace. The brace is attached to an L-shaped bracket on the anvil block, so it can be raised and lowered to permit the hammer to strike with the face parallel to the work. The bell-crank lever is attached to the side of the anvil block with the foot piece near the operator. If several holes are drilled in the top part of the bell-crank lever, the length of the stroke can be adjusted.—Contributed by A. Walle, Ludington, Mich.

Easily Made Bench Centers

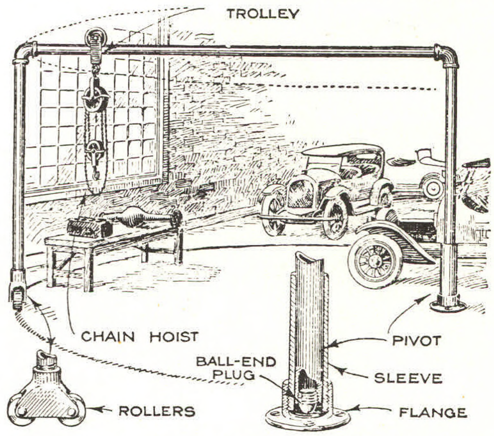
For use in garages and small repair shops, where it is often necessary to swing an armature, shaft, or other part between bench centers, the device shown in the drawing can be made from a pair of discarded connecting rods.



The connecting rods are bolted to the bench through the bearing-cap screw holes, as indicated, and the wristpin ends are provided with centers made from round steel rod. The centers are adjustable for various distances, the setting being maintained by tightening four wristpin bearing bolts.—Edwin Schubach, Chicago, Ill.

Radial Shop Crane

A crane suitable for the garage and machine shop, that involves no structural changes in roof or wall beams and re-

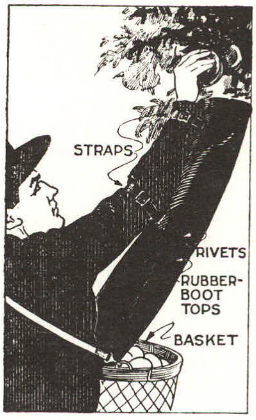


A Radial Shop Crane for the Garage and Machine Shop That can be Pushed to Any Point of Its Circular Path

quires no separate guides, is constructed, as illustrated, from pipe, making it sufficiently simple and inexpensive for any shop, even though it be used infrequently. A center pivot, consisting of a section of pipe and a closed-end floor flange, supports one end of the crane in the manner shown in the detail. The outer end of the crane is supported upon rollers so that the device can easily be pushed around.

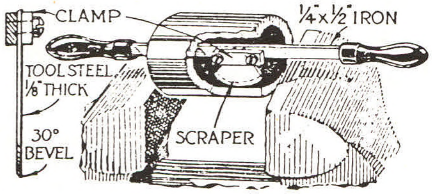
Rubber Bootlegs Provide Chute for Picking Fruit

To form a chute from my picking hand to the basket in which I dropped the fruit, I used two old bootlegs. These were cut from a pair of discarded hip boots and riveted together, as in the sketch. Two straps, long enough to reach around the arm, were fastened to the upper part of the chute, as illustrated. The basket is suspended with a



shoulder strap in such a position that an apple dropped down the chute rolls into it. For picking soft or overripe fruit a canvas tube might be attached to the lower end of the chute and extend to the ground, where the fruit could be caught and sorted by a helper.

Double-Handled Tool for Scraping Bushings

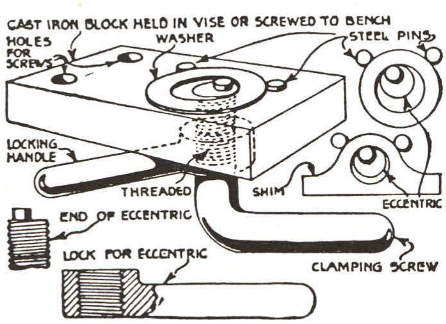


SCRAPING bushings with a single-end scraper is such a tedious job that one machinist made the double-handled tool shown. It has a tool steel blade that can be changed quickly for a sharp one. A small clamp holds the blade firmly in place.—W. L. M.

Eccentric Clamp Holds Bearing Shims or Washers

FOR filing down solid shim blocks such as are used in connecting rod bearings or for facing off circular washers or other parts not easily held in the jaws of a vise because of their thinness and shape, a clamping fixture may quickly be made like the one illustrated.

The body of the holder is a rectangular block of cast iron with a tapped hole. A section of bar stock is threaded to suit the



Washer is gripped between steel pins in the block and clamping lever

tapped hole and a pilot turned on one end, the pilot being made eccentric with the body of the screw. A piece of bar stock is then forged as shown and the end tapped to correspond with the screw. This serves to lock the eccentric clamp.

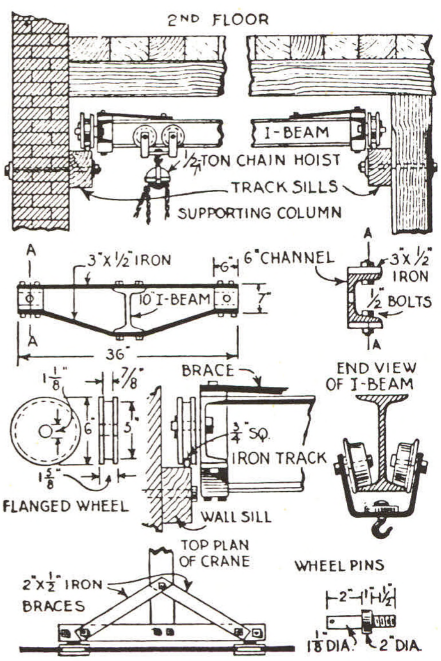
Holes drilled in the face of the cast iron block are fitted with small removable pins so that when the edge of the washer is placed against the pins, the eccentric can be turned until the part is clamped tight. The block is held in the jaws of a vise or one end can be screwed to the top of the bench in such a way that the clamp screw overhangs the edge.—M. J. V.

How to Build an I-Beam Garage Crane

THE universal I-beam garage crane illustrated can be built at minimum expense in any garage repair shop. It is fabricated mainly of standard steel or iron shapes, and most of the work consists merely of drilling and bolting the parts together.

Wall sills are bolted to one wall and to the opposite wall, posts or other supports, as shown. These should be sound 4 by 6 in. yellow pine or other strong wood, and supported with bolts every 3 ft. along the wall. Tracks of ¾-in. square iron are fastened to these sills with countersunk wood screws spaced 12 in. apart.

The crane proper is a section of 10 inch I-beam to which traveling ends are at-



How the parts of the track and trolley are made and the way they are assembled

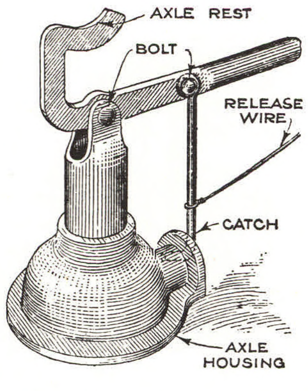
tached, as indicated. The beam forms the bridge and trolley track for the chain hoist.

The end carriages are ½ by 3-in. flat iron or steel, the top piece being straight and the lower piece bent to the form shown. At each end these pieces are bolted to a 6-in. length of 6-in. channel iron and the channels are drilled to take the pulley shafts, which are turned of round, cold rolled steel. The flanges butt against the channel iron and are held in place by a nut on the rear.

The wheels are cast iron, machined with ⅞-in. grooves to fit freely on the ¾-in. track. Oil holes are drilled for lubricating the bearings. Braces of ½ by 2-in. iron keep the end carriages firm and square. The trolley can either be purchased already assembled or made up in the shop along the lines shown.—J. R.

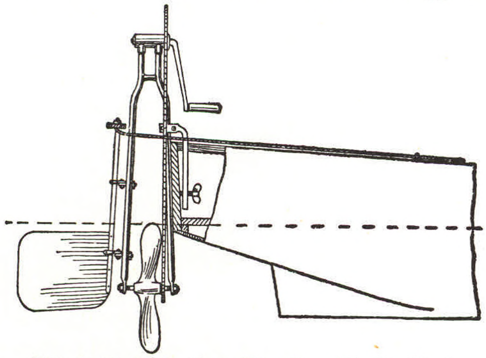
Jack Made from Axle Housing

Jacks around the service station are often "borrowed" without being returned. To avoid the cost of providing jacks for those lost in this manner, one station used jacks of the type shown in the drawing; these were made in their own shop. Sections of the axle housing of light automobiles were used, cutting them as shown and fitting a forged lifting bar and hook, to hold the jack in its raised position. Such jacks are always returned, as they are too large to fit in the tool box or under the seat of an auto.



Hand Propeller-Wheel Attachment for a Rowboat

The rear fork of an old bicycle frame, with the crank hanger attached, and the rear hub constitute the main parts of the propelling device. One of the cranks is cut from the hanger and a bracket attached to the frame, as shown, for making it fast to the stern of the boat. Two propeller blades are bolted to the rear hub. A rudder is fastened to the rear tube of the frame with hooks and eyes so that it can be turned with a handle at the top, or

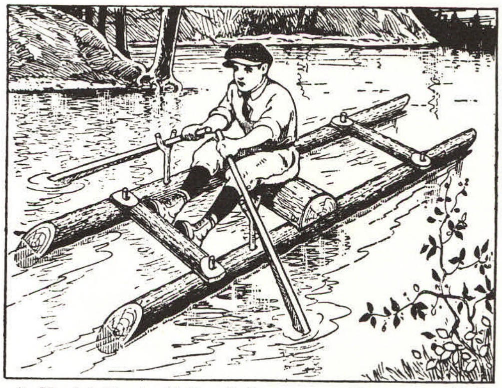


The Rear Fork of a Bicycle with Its Parts Constitutes the Main Propeller Attachment

with ropes run to a wheel. The illustration shows the connection of the device to a boat.—Contributed by Berge Lion, Fresno, Cal.

Making a Catamaran Raft

A simple raft, that will meet the requirements for an inexpensive and simple



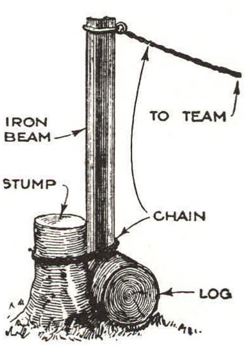
A Useful Boat, Built of Logs as a Catamaran Raft, Takes the Place of a Regulation Rowboat When the Latter is Not Easily Obtained

boat, can be made from two or three logs in the manner indicated in the drawing.

Two logs, about 12 ft. long, are used for the sides, and connected with crosspieces, spikes or wooden pegs being used to secure the parts together. A piece of split log answers for a seat, and two forked branches, inserted into the sidepieces, make satisfactory oarlocks. In the absence of regulation oars, pieces of board can be cut to approximately the proper shape.

A Simple Stump Puller

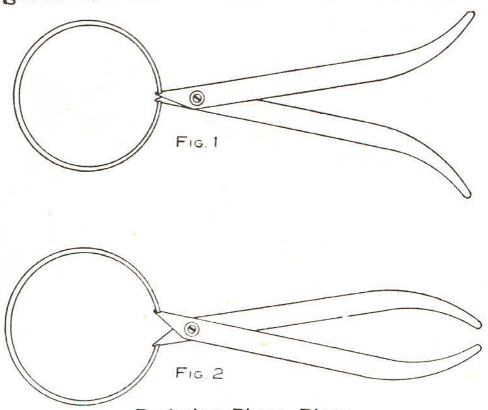
In upper Wisconsin, where thousands of acres of cut-over timberland are being cleared for agricultural purposes, an easily constructed but powerful stump puller is being largely used with good effect.



The device resembles a huge mallet, with a log for a head and an iron beam, or piece of steel rail, for the handle, the purpose being to obtain increased leverage in pulling the stump. In use, the puller is chained to the stump in the manner shown in the drawing, and a team of horses is hitched to a chain attached to the extremity of the handle. The pull gives a rolling movement to the head that has a tendency to lift the stump, while the power of the team, applied to the handle as a lever, is greatly increased. A stump puller of this type is a very effective substitute for the horsepower capstan-type puller, excepting in the case of very large stumps.—Leo P. Cook, Marinette, Wis.

Tool for Removing Piston Rings

A very simple combination tool for the use of those manufacturing or repairing automobile and small gas engines can be made as shown herewith.

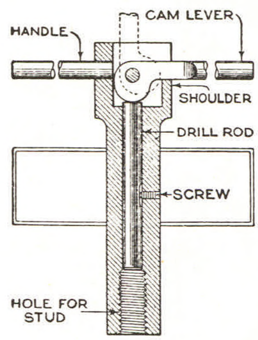


Replacing Piston Rings

The tool is made of two 1/16-in. strips of steel cut as shown in the sketch and fastened together with a screw and thumb-nut. By tightening the nut it can also be used as an inside or outside caliper. Figure 1 shows the tool in position for spreading the ring; Fig. 2, ready to slip on or off the piston.—Contributed by J. O. Brouillet, Tarrytown, N. Y.

A Hand Stud Driver

Wherever a number of studs of the same size are to be driven, the hand-operated driver shown in the drawing will be well worth making.

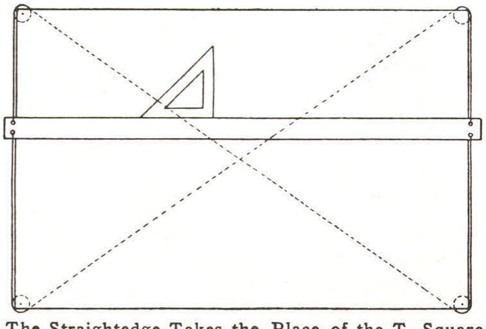


The body is drilled entirely through, and is tapped for a short distance at the bottom to take the studs to be driven. A piece of drill rod, cut to the required length, is provided with a small flat so that it can be held loosely inside the body by a small setscrew, as indicated. The top of the body is slotted to take the cam lever, leaving a shoulder for the lever to rest upon when the stud is being driven. The cam lever is made as shown, and is held in place with a pin, upon which it turns, while a fixed handle is set into the opposite side of the body.

In use, the driver is threaded onto a stud until it touches the end of the internal rod, the cam lever being horizontal. The stud is then driven home in the work. To release the driver and permit it to be backed off the stud, the cam lever is raised to the position indicated by the dotted lines, which relieves the pressure against the stud.

Parallel-Rule Attachment for a Drawing Board

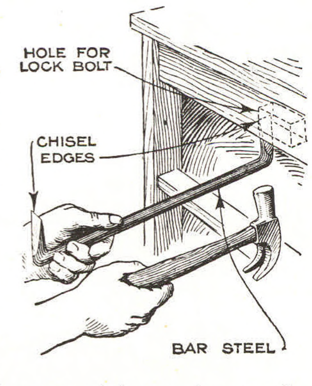
A parallel rule may be attached to an ordinary drawing board with the use of a straightedge, four grooved pulleys and some flexible wire cord. The pulleys are attached flat on the under side of the board, one at each corner, and the cord run around them as shown. The ends of the straight-


The Straightedge Takes the Place of the T-Square and can be Moved over the Board to Make Parallel Lines

edge are clamped to the cord that runs along the ends of the board.—Contributed by Leonard Den Bleyker, Paterson, N. J.

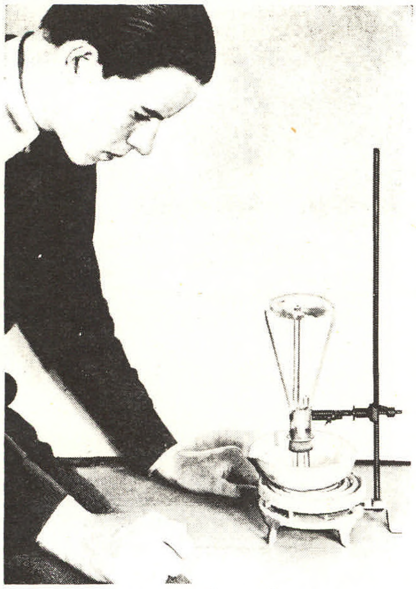
Special Chisel for Lock Fitting

The drawing shows a chisel for the special purpose of setting in mortised locks or making holes for the lock bolt in cabinets, desks, and other places where space is too cramped to permit the use of the ordinary hammer and chisel.



The chisel is made from a 15-in. bar of tool or drill steel, the ends of which are bent at right angles to the body. A blade is forged on one end with the edge parallel with the body, the one on the opposite end being made at right angles. In use, the tool is held in the hand, near the outer end, and the chisel is struck with the hammer as close to the cutting blade as possible.—G. A. Luers, Washington, D. C.

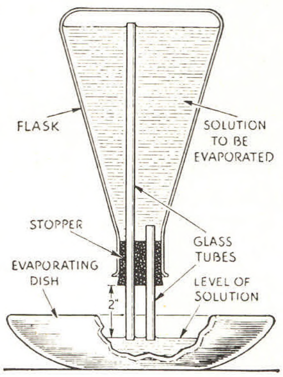
You Can Make This Handy Automatic Evaporator



Here it is in use with an electric heater

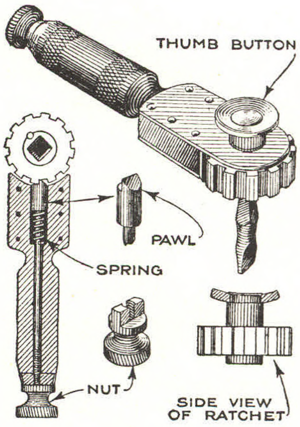
HERE is an example of a piece of laboratory apparatus easily made by the young chemist. It is an automatic evaporator. The solution to be concentrated is placed in the flask, which is equipped with a two-hole cork stopper. A glass tube passes through one hole, just entering the flask and projecting two inches on the outside. A longer glass tube projects to the bottom of the flask and also extends two inches on the outside. The whole device is inverted over an evaporating dish or beaker, which is then heated. The liquid automatically flows from the flask and is concentrated in the dish or beaker, where it is kept always at the same level.

How the evaporator is constructed. It feeds the liquid into the dish



A Ratchet Screwdriver for Confined Places

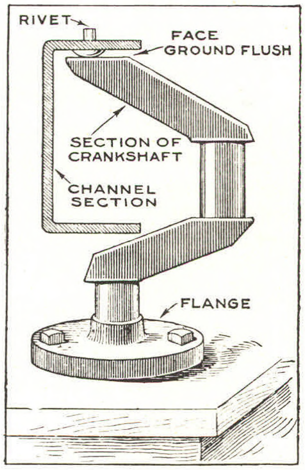
Having often experienced difficulty in removing screws from narrow and shallow places, and finding the usual bent screwdriver unsatisfactory, I devised a simple and easily made ratchet tool for work of this character. I flattened one end of a piece of ½-in. round steel, and drilled it through the center, one end being counterbored to accommodate the pawl and its spring. Three small holes were drilled on each side of the flattened portion for riveting two sheet-iron pieces, which serve as bearings for the ratchet wheel. The ratchet is made from 1-in. round stock, with a square hole at the center to hold the square-shank screwdriver bit. A thumb button is riveted to the top of the ratchet wheel, holding the tool to the work. By pulling out on the nut and giving it a half turn, the direction of rotation can be changed at will.—J. Magis-Frankhart, Ouffet, Belgium.



A Handy Riveting Anvil

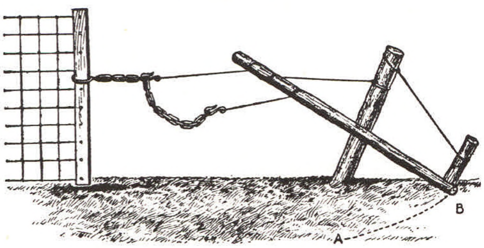
Many riveting jobs require the work to be placed on an offset, to accommodate parts of the work while the rivets are being set, and this is particularly the case on channel iron and work of similar section.

An old automobile crankshaft can be utilized to make a very convenient anvil of this character, as indicated in the drawing, with very little trouble. The shaft is cut off between two crankpins and the cut face ground, or otherwise smoothed off, to provide a plane surface. The section is bolted to a suitable support by means of screws, or bolts, through the flywheel flange. An anvil of this type will prove a useful fixture in the garage for such work as relining brakes, repairing lamp casings, and other work where an opening under the face of the anvil is required.



Wire-Fence Stretcher Has Powerful Leverage

The force which can be exerted by this stretcher is limited only by its size and strength of construction. The materials necessary are three poles or small logs, some heavy wire, a length of stout chain, and two hooks which can be purchased at any hardware store or forged from iron-bar stock. The stretcher is shown in use; the next motion will be to move the handle end of the long lever from B to A, hitch the loose hook several links forward on the chain, and stretch again by returning the handle from A to B. The leverage exerted can be made as great as desired by lengthening the lever and

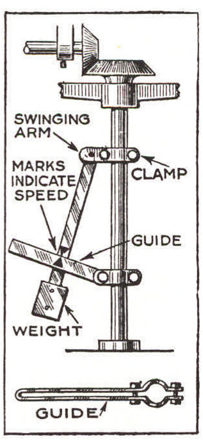


The Fence can be Stretched as Tight as Desired by Means of this Simple Lever Arrangement

bringing the hook wires closer together.

Speed Indicator for Vertical Shafts

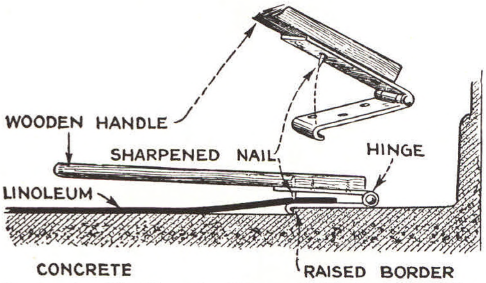
Where vertical shafts are to be run at a constant speed, as with dynamos and water-power apparatus, a simple speed-recording device, using the principle of centrifugal force, can be easily made.



A strip of flat stock is bent to make a guide for the swinging arm, and clamped to the shaft in the manner shown. A weighted arm is similarly clamped to the shaft, in such a manner that when the shaft is rotating at the proper speed, the position of the weighted arm is noted and the place conspicuously marked on both guide and arm. The guide may be temporarily marked by attaching a piece of chalk to the arm.

Fitting Linoleum Snugly against Raised Concrete Border

Cutting linoleum to fit snugly against a raised concrete border is a task that re-

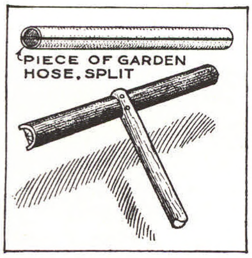


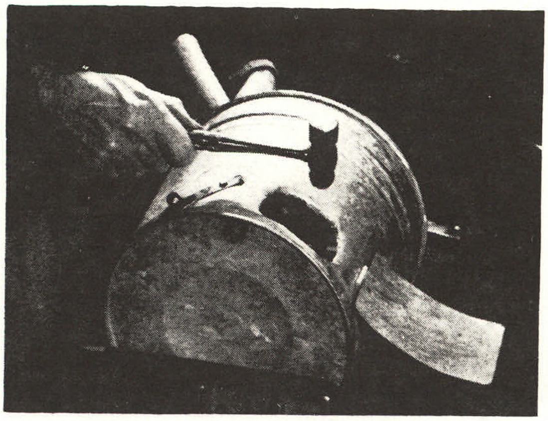
Device for Marking the Edges of Linoleum So That It Will Fit Snugly

quires considerable care, and the usual method of scribing is impractical in this particular case. The work is facilitated by the use of the simple tool shown in the illustration. It consists of a 4-in. strap hinge, screwed to a 12-ft. length of 1 by 2-in. board. The free portion of the hinge is bent over as indicated, and a sharpened nail or screw is driven into one of the holes in the other part, the point of the nail being directly over the bent edge and consequently directly in line with the edge of the raised border. In use, the loose leaf is fitted over the edge of the linoleum as shown, and the handle is depressed to make a punch mark, which indicates the exact point where the linoleum is to be cut to make a snug fit against the concrete border. The hinge is then slid along the edge and the operation repeated at 1-ft. intervals, leaving a row of punch marks that serve as a guide in scribing the cutting line. This device eliminates the frequent shifting of the linoleum necessary when scribing in the usual way.—Mary Gleeson, San Francisco, Calif.

Garden Hose Makes Window Squeegee

An old broom handle and a piece of garden hose can be made into a squeegee, for scraping the water from windows without the necessity of wiping the glass with cloths, or for scraping water and slush from sidewalks. A piece of the broom handle is cut to a semicircular section and covered with a piece of garden hose which has been split in half and tacked to the wood. A suitable handle, as shown in the drawing, completes the tool.





Opening 2" by 3" and hinged metal door provide draft

Roll 1" by 3¼" strips of tin can on a dowel for tubes

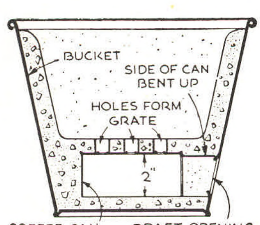
Fire-clay mixture is built up to top of tubes

Charcoal-Burning Fire Bucket Takes Chill Off Winter Sports

SKATERS and other winter-sports fans will appreciate this handy fire bucket. Reviving numbed fingers is only one of its uses. Over it you can heat chocolate and other beverages at the lake shore, or, if adequate ventilation is provided, it will warm a fish house or ice-fishing shanty. Nor does its usefulness end with winter, for it makes an efficient picnic stove, and with a grate will grill steaks, toast marshmallows, or cook coffee.

Cut an opening in a 10- or 12-qt. galvanized bucket about ½" above the bottom for a hinged sheet-metal door. Mix 10 lb. of fire clay in the ratio of one part clay and five parts silica sand or crushed fire brick with just enough water to form a stiff paste, and spread the mixture ½" deep over the bottom of the bucket.

Make two parallel cuts up the side of a squat coffee can so that a 2" by 3" piece can be bent up parallel with the bottom. Then punch five or six ¾" holes in the bottom of the can. Into these fit tubes made of tin-can metal. Center the can on the bottom of the bucket, and use tin plate to form the sides of a tunnel connecting the two openings. Add more of the clay mixture over the top of the coffee can; then build up a 1" layer on the inside of the bucket up to the top, smoothing as well as possible.

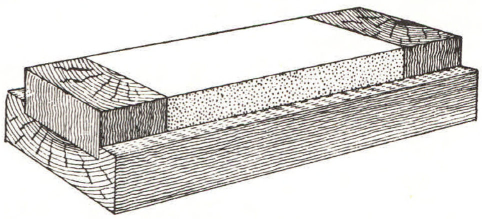


The first fire, after the clay is thoroughly dry, should be a small one to "burn in" the lining. Some cracks may appear later, but usually do no harm. Always set the bucket on stone or some other fireproof support, and use it outdoors or in a well-ventilated place.

To start a charcoal fire, use paper, excelsior, or wood splinters, and close the draft partly or wholly after there is a good bed of coals.

Setting an Oil Stone in a Block

Oil stones wear away and make a hollow in the center caused by the bulk of the rubbing coming at that place. This can be corrected if the stone is set in a block, as shown in the accompanying sketch, with pieces of hard wood, about 2 in. long, set in at each end, their surfaces flush with the face of the stone. This will enable the workman to whet over each end of the stone as well as in the middle, thus wearing it away evenly. Should the stone show any hollow places after long use, take a piece of fine sandpaper and lay it

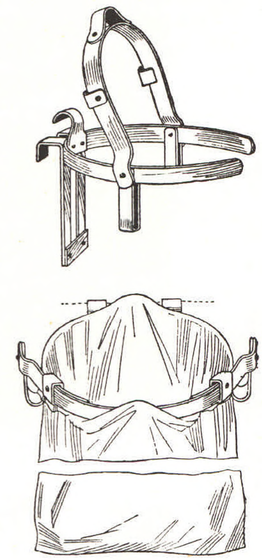


Hardwood Block at Each End

flat on a board, turn the stone face down and rub it briskly. This will dress the high places down and make the surface level.—Contributed by Wm. Lutzenburger, Dayton, O.

A Bag Holder

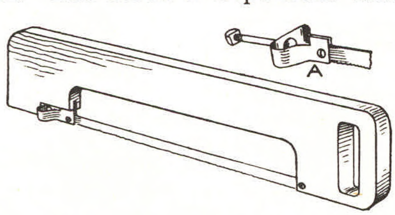
The bag holder shown in the sketch is designed to hang on a barrel, bin, truck, or any other convenient place. The parts are made of strap iron and shaped as shown, requiring no exact lengths. The yoke should be the size of the bag top. The U-shaped pieces at the sides permit the top of the sack to be turned over the yoke. Two clips are riveted to the moving part, projecting over and catching on the yoke sides to prevent it from dropping too far down. The hooks and vertically extending parts are used to hold it on a box or barrel.



To fill the bag, place its upper edge over the hook at the back and between the yoke, so that the edge overhangs. The clamping band is drawn down over the bag top where it holds the cloth securely without injury.—Contributed by J. F. Reed, Johnstown, Pa.

Homemade Hacksaw Frame

A home workshop not having a complete set of tools may be supplied in many ways with tools made by the owner. The hacksaw frame illustrated is one of these. The frame is made of hard wood. The saw end is inserted in a slot sawed in the handle end, and a screw or small bolt holds it in place. The other end is equipped with a bolt having a sheet-metal head, as shown at A. The blade is kept from turning

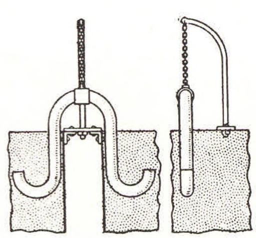


Hacksaw Frame, Cut from Hard Wood, with Fittings Attached to Draw the Blade Taut

by a projection of the sheet metal which fits in a saw cut made in the frame.—Contributed by W. A. Henry, Galesburg, Ill.

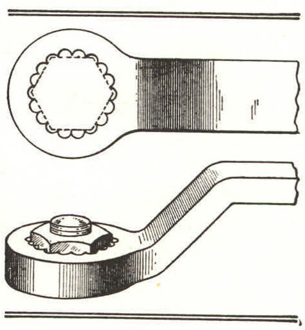
A Siphon That is Easily Kept Primed

A ready-primed siphon can be made by bending a piece of pipe into the shape shown in the illustration. After being once filled, the water, or other liquid, remains in the pipe as long as the outlets are level. It is preferable to balance the pipe by means of a chain, as shown, and connect it with a collar on the pipe, for adjustment. This method of siphoning provides a temporary means of connecting two adjacent tanks, and is useful for many other purposes where the flow is irregular and personal attention unavailable.—A. W. Allen, New York, N. Y.



Wrench for Cylinder-Base Nuts

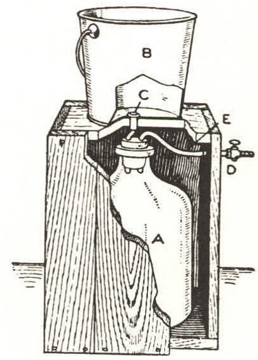
Cylinder-base nuts are, in many cases, so located that they can only be turned with a chisel. The reason for this is simple; the corners of the hexagon nut being 60° apart, the nut requires to be turned 60° before the wrench can be replaced on it and the turning movement continued; on the other hand, conditions usually permit turning the wrench no more than 30°, obviously making it impossible for the common wrench to resume its hold on the nut.



The drawing illustrates the construction of a simple wrench that will grip the hexagon heads of capscrews or nuts in any position so that the wrench can turn the nut as far as possible. A circle of holes is drilled in the wrench, as indicated, and the center piece knocked out; with this arrangement, no matter in what way the wrench is applied, the corners of the nut or bolt head will fit into some of the holes in the manner shown. The wrench head should, of course, be casehardened.—C. Nye, New York, N. Y.

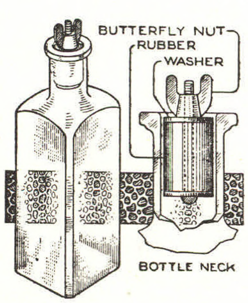
Automatic Air Supply for Blowpipe

When no air supply under pressure is provided for a blowpipe in the shop or laboratory, the arrangement shown in the sketch may be made quickly, and will give a constant supply of air for from 20 to 30 minutes. A wooden frame, or box, is constructed to contain a large glass bottle or a 10-gal. carboy, A. It is provided with a two-hole stopper and rubber tubes, connected through them, to the interior of the bottle. One of the tubes, E, is connected to a stopcock, D; the other is fitted through the bottom of an ordinary water pail, B, as shown at C. A metal, cork, or rubber fitting is provided at C, which may be plugged so that the pail is water-tight. The pail is then filled with water and connected to the bottle as shown. When the water is permitted to drain from the pail into the bottle, the air is forced out of the latter and may be conveyed to the blowpipe from the stopcock D.—Reginald R. Wayt, Pittsburgh, Pa.



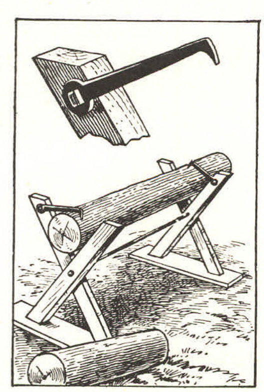
Expansion Bottle Stopper Prevents Leakage

A bottle stopper that cannot come out, or leak, under any circumstances is handy for many purposes and is especially appreciated by travelers who must carry medicine, or other liquids, in a traveling bag. Anyone can make the stopper illustrated. An ordinary perforated rubber plug is provided for the bottle, and a slender stove bolt is passed through it, with washers at both ends. A wing nut is fitted on the end of the bolt, which, when tightened, expands the stopper and seals the bottle securely.—W. P. T., Buffalo, New York.

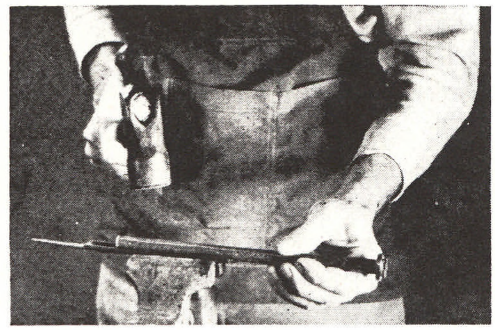


Dogs Aid in Sawing Wood

Two simple grippers, or dogs, fastened to opposite sides of a sawbuck, as shown in the drawing, will greatly facilitate the work of sawing wood into stove lengths, by holding it so that it cannot move as it is being sawed. The dogs are made of iron and bolted to the buck in the manner shown. In use, the sharp points are pressed into the wood, relieving the sawyer of all the effort that is generally required to keep the wood from turning a little with each stroke of the saw.—P. T. Williams, Hairoa, N. Z.



FORGE YOUR OWN CARVING CHISELS



The gouge rests on vise jaws while being hollowed.

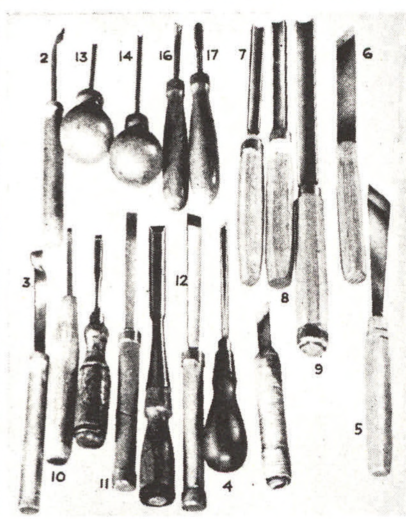
FLAT files and umbrella ribs afford excellent steel for making both small and large carving chisels. They can be heated for forging with a blowtorch set up to blast into a small pocket or oven of loose stones or bricks. As a jig for hollowing gouges, clamp a piece of angle iron in a vise or support it in a groove cut in a block of wood.

To make a gouge (Nos. 7, 8, and 9) break off a file near the bottom of the end taper, heat it red, and lay it in the angle iron. Beat along the center with a ball-peen or cross-peen hammer; then deepen the hollow with a round iron rod hammered in, reheating as necessary to keep the temperature up to redness. Finish hollowing in the vise with the jaws open almost enough to let the file slip between.

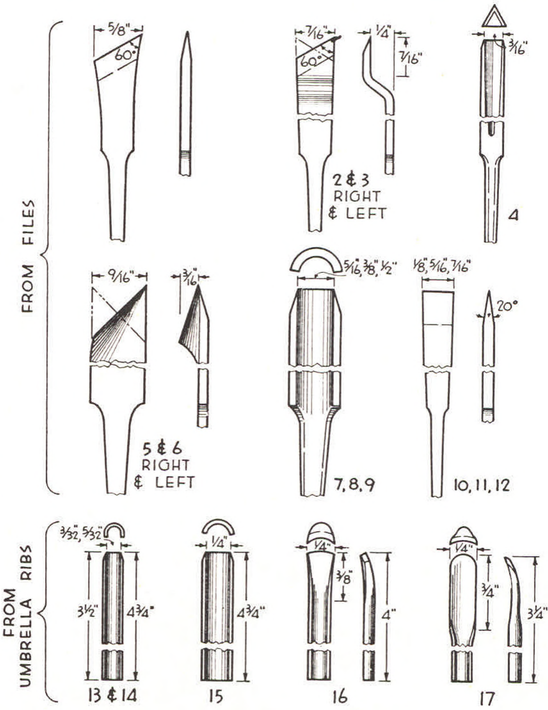
Sharpen the tip of a cone skew (Nos. 5 and 6) to a point first, and then bend the end over the edge of the vise, rolling it into a cone. The angle may be about 75 deg. before rolling. One tool is right-handed, the other left. Spoon skews, Nos. 2 and 3, also identical except for right- and left-hand angles, are hot-bent with pliers.

File a groove in one face of a three-cornered file for the veining tool, No. 4, after drawing the temper, and file the bottom edge sharp. Flat chisels can be ground cold without first drawing the temper. Umbrella ribs, their temper drawn, are opened up for small gouges, No. 13, 14, and 15, or flattened and bent for Nos. 16 and 17.

Rough-grind cutting edges before rehardening and tempering to a straw color. Sharpen gouges square across and beveled outside, spoon skews beveled from the back, and skew knives and flat chisels beveled on both sides. Grind the teeth off inside gouges and unbeveled faces.—E. M. L.



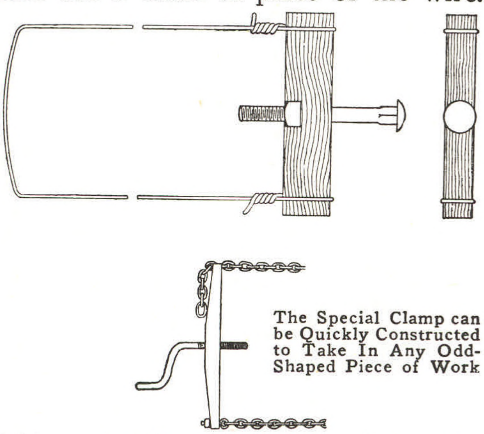
Homemade except for two socket-firmer chisels (unnumbered), the tools shown above make up a good wood-carving kit. The small gouge, No. 15, may be added. Mill files 4" to 8" were used except for No. 4, which required a triangular file, and No. 10, a 4" square file. Two sizes of umbrella ribs were used.



A Special Cabinetmaker's Clamp

In many cases where odd-shaped pieces are to be glued together, the ordinary clamp cannot be used, and some sort of holding device must be substituted. For such clamping I construct the temporary arrangement shown in the illustration. It consists of a piece of wood, strong enough to stand the strain and of a proper length to suit the work in hand. In the center of the wood a hole is bored to receive a bolt, and a wire loop to take in the parts to be clamped is provided. The nut of the bolt is set in the wood to prevent its turning, and the ends of the wire are looped over the ends of the wood. In operation, the bolt is turned up to make it press against the parts to be clamped.

A better arrangement of this clamp is to have a metal head, or crosspiece, and use a chain in place of the wire.

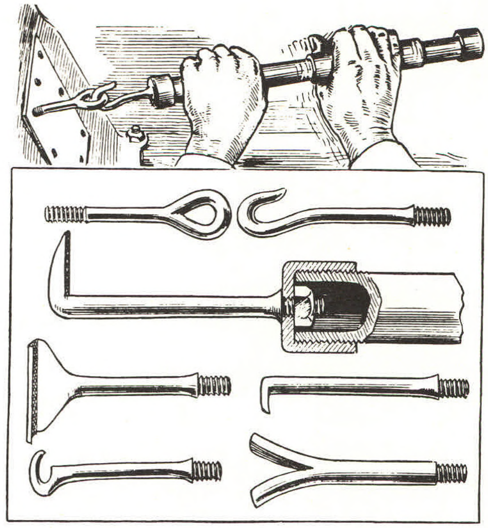


The Special Clamp can be Quickly Constructed to Take In Any Odd-Shaped Piece of Work

This makes it adjustable so it can be used for various-sized clamping operations.—Contributed by Wm. A. Robinson, Waynesboro, Pa.

An Emergency Chuck for Engravers

If it is desired to do some engraving on a signet ring and no engraver's chuck is at hand, the ring can be held in a grip made of a cork fitting in a large-neck bottle. A notch is cut in the top of the cork to receive the ring tightly after which it is pressed into the bottle neck. Because of its slight taper, the cork will grip the ring tightly when it is pushed in, and will not mar the metal.—Contributed by C. F. Gronemann, Elgin, Ill.



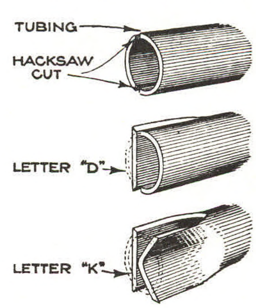
Reverse Hammer, Made from Pipe Fittings, Will Be Found Useful for Many Purposes

Reverse Hammer Has Many Uses

Many workmen often feel the need of a reverse hammer, that is, one that exerts a pull by jarring it backward. The one shown in the drawing is made up almost entirely of pipe fittings and is equipped with a number of interchangeable hooks adaptable to all kinds of work. The body of the tool consists of a pipe nipple, 12 or 18 in. in length, fitted at each end with a cap. A 6-in. sleeve, fitting rather loosely on this nipple, but restrained from coming off by the caps, provides the driving power by being struck sharply against the rear cap. The front cap is drilled, the hole is tapped to receive the threaded ends of the hooks, and a nut is provided on the inside to prevent stripping the thread in the cap. Modifications in the size of this tool depend on the use for which it is desired. Uses for such reverse hammers extend from the watchmaker's trade to the heaviest kind of engine work in ships and power houses.—J. E. Hoag, Alhambra, Calif.

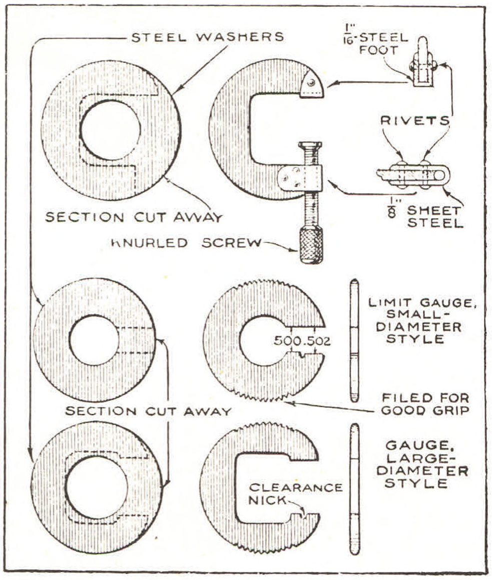
Wood or Leather-Branding Dies

A set of serviceable wood or leather-branding dies that may be used either with a hammer or heated, can be made cheaply, with a little patience, from metal tubing of the proper size by splitting the tubing for a short distance at the end. After the proper number of cuts have been made, the semicircular sections and segments of tubing are pressed or pounded into the proper shape and afterward dressed off with a file to sharpen the letters and even up the faces.—Serg. Kellum, Annapolis, Md.



Tools Made from Steel Washers

The common C-clamps that one usually buys are easily broken, due to the use of malleable iron for the frame. Ordinary steel washers of suitable size, ground and polished, can be utilized to make a substantial set of clamps, as well as small-diameter snap gauges.



Snap Gauges and C-Clamp for Work of Small Diameter That can be Made in the Small Shop from Ordinary Steel Washers of Different Sizes

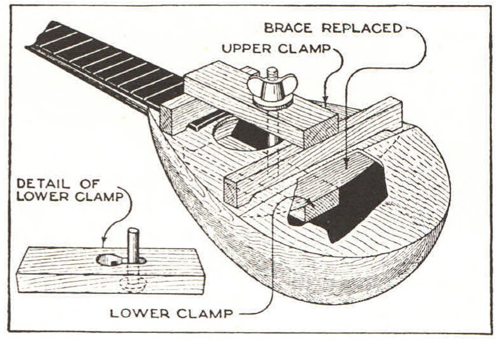
In making the clamps, a section of the washer is cut away, as shown in the drawing, and to the remaining part a U-shaped steel foot is riveted, to form the clamp face. Another U-shaped piece is riveted to the opposite side and tapped to take an adjusting screw of suitable type and size. If additional strength and finish are desired, the product may be casehardened.

The manufacture of the snap gauges is carried out by cutting a section out of the washer, the width of the opening being brought to the minimum size by filing or grinding. Then, with a three-cornered file cut the notch in the center of one of the faces and enlarge the half face in the front to the maximum size. Rounding off the edges completes the work and leaves it ready to be hardened; this is done by dipping the gauges into melted potassium cyanide (poison) until they attain a good red heat, then quenching in cold water.

After hardening, the gauges should be checked for size and the faces lightly lapped bright with a fine-grained oilstone.

Repairing a Broken Mandolin Brace

Permitting a mandolin to remain in a damp place resulted in a broken brace and a caved-in top, due to the pressure



Repairing a Broken Mandolin Brace and a Caved-In Top without Having to Send the Instrument to the Factory, by the Use of a Simple Wooden Clamp

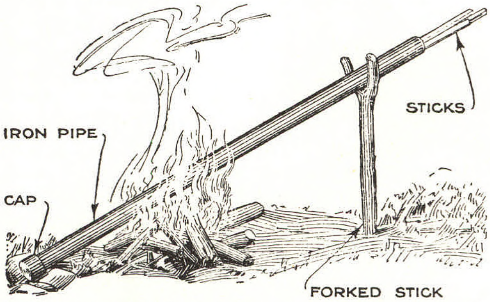
of the strings on the bridge. The brace, located directly underneath the bridge of the instrument, could not be reached on account of the small size of the hole in the sounding board, which added to the difficulty of making a repair. After two or three unsuccessful attempts at repair without special preparation had been made, the following method was used successfully.

A clamp was made, as in the drawing, from 3/4 by 2-in. hardwood, with a lower piece, about 6 in. long, provided with a block on one end, and a hole and slot in the center. The upper part of the clamp was made with a similar block at one end cut out to clear the fingerboard, and a bridge, fashioned to rest on top of the instrument near the edges, on the other.

Using the broken pieces of the old brace as a pattern, a new one was made, and, holding the mandolin upside down, the brace, well smeared with glue, was placed as nearly in the proper position as possible. The lower half of the clamp, inserted through the sound hole, was placed with the block resting under the end of the fingerboard. The head of a 1/4-in. bolt was inserted through the hole, secured by sliding into the narrow slot, and then fastened through the upper half of the clamp with a wingnut. After adjusting the upper clamp so that one block bridged the fingerboard and the other one rested on the edges of the instrument, the wingnut was given a few turns, bringing the brace back into position, and the top of the mandolin with it. When the glue had been allowed to harden properly, the clamp was removed.—C. M. Vail, San Francisco, Calif.

Steaming Wood for Bending

There are many devices and methods for steaming woods, most of them more or less complicated and unhandy, and de-



A Convenient Method of Steaming Lumber for Bending Requires Nothing More Complicated than a Piece of Iron Pipe and a Forked Stick

pending upon a supply of steam from a boiler or kettle.

An inexpensive method of steaming lumber for bending, when there is but little of this work to be done, is shown in the drawing. A piece of iron pipe, a little shorter than the sticks to be steamed, and having a diameter large enough to accommodate several pieces, is capped at one end. The closed end rests on the ground and the open end is elevated at an angle of about 30°, supported in the crotch of a forked stick. The pipe is partly filled with water, the sticks inserted, allowing them to project an inch or two, first tying the pieces together so that they can be pulled out and reversed in the pipe when one end has been sufficiently treated. By replenishing the water as often as necessary, the wood can be both boiled and steamed until it is thoroughly pliable.—L. B. Robbins, Claremont, Calif.

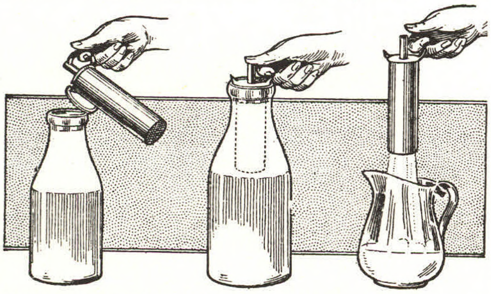
Holding Small Parts Is an Easy Matter with This Improvised Quick-Acting Clamp

Improvised Quick-Acting Clamp

In an electrical shop, it was necessary to solder and fit a large number of small pieces. To loosen and tighten the vise each time a piece was removed and reinserted, was found inconvenient, so the method of holding the parts by means of a pair of heavy pliers, as shown in the illustration, was used and found entirely satisfactory. One handle of the pliers was caught in the vise, while a length of pipe, with a weight on the end, was slipped over the free handle. The work, held in the jaws of the pliers, can be instantly released by merely lifting up the weighted handle.—G. A. Luers, Washington, D. C.

SEPARATOR REMOVES CREAM ONLY FROM MILK BOTTLE

A utensil for removing cream from a milk bottle consists of a cylinder about half the length of a quart bottle and of a diameter slightly less than

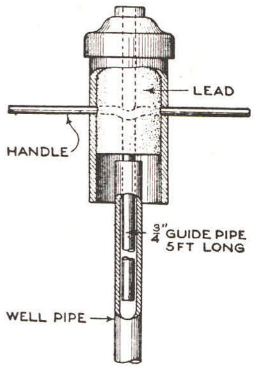


A Simple Utensil with Which Cream may be Removed from a Milk Bottle without Mixing the Cream with the Milk

that of the mouth of the ordinary milk container. The device is held in one hand, the index finger passing through a small looped handle at the upper end. Projecting from the otherwise closed upper end of the cylinder is a small tube. A screen extends across the cylinder's lower end. After inserting the separator into the bottle to the depth of the cream, the thumb is placed over the end of the tube. The separator may now be lifted from the bottle filled with cream, the screen and suction combining to keep the fluid from flowing downward.

Driving Well Pipes

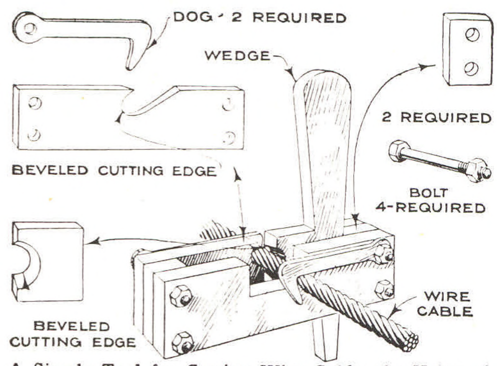
Where water at slight depths below the surface is found suitable for household purposes, the most practical and inexpensive method of sinking a well consists in driving a screened drive point into the earth. After boring a few feet below the surface, place the pipe, with the point attached to the lower end, in the hole, and drive it down until the flow of water is reached.



In order to drive the point to the desired depth, much care is needed to avoid injuring the pipe threads. To make the work simple, and a one-man job, the hammer shown in the drawing can be used with excellent effect. The 3½-in. diameter brass shell of an old pump cylinder was obtained, although a similar piece of pipe with a cap over one end will answer as well. Holes were drilled through opposite sides, large enough for a piece of ¾-in. iron rod to serve as a handle. A piece of ¾-in. pipe, about 5 ft. long, was screwed into the cap on the end of the pump cylinder, as in the drawing. The hammer was weighted by filling the interior with 12 lb. of melted lead. In use, the pipe guide is inserted inside the well pipe, and the hammer is lifted and allowed to drop, forcing the point deeper into the earth at each stroke. —Geo. G. McVicker, North Bend, Neb.

A Fixture for Cutting Wire Cable

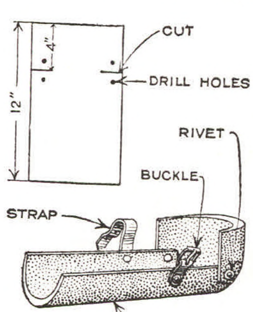
The drawing shows a tool whose value can best be appreciated by loggers, seamen, and miners, as, with it, a wire cable of ordinary dimensions can be easily cut. The frame is made of tool steel and one side is provided with a cutting edge which acts as a shear blade; this cutting edge is beveled and tempered. The opposite frame member, which may be of mild steel, is provided with an opening to permit movement of the cable. The frame is assembled by placing spacers at each end and bolting, as shown; this will leave an opening in the center for the insertion of the sliding cutter and wedge. The cutter is made of tool steel with a beveled, semicircular cutting edge, which is hardened and tempered. The dogs at the sides prevent the cable from bending while it is being cut. Both the wedge and the cutter should fit snugly, without sideplay, and plenty of oil should be used when making a cut. The cutter is operated by placing the cable between the two cutters and driving the wedge in behind the sliding cutter with a sledge hammer.—Chas. O. Olsen, Portland, Ore.



A Simple Tool for Cutting Wire Cable, the Value of Which will be Appreciated by Seamen and Lumbermen

Knee Pads Made from Auto Casing

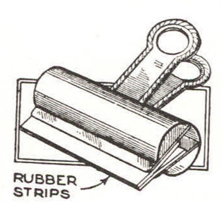
Persons whose work requires them to be in a kneeling position much of the time, such as carpet layers, concrete workers, etc., will find that a substantial, durable, and waterproof pair of knee pads can be made from old automobile casings, as shown in the drawing.



A 12-in. length is cut from an old casing, and about 4 in. from the end, two 1-in. slits are made at each side. The short end is then bent up, as shown, and riveted into place. A suitable strap and buckle completes the job.—Truman McNiel, Seattle, Wash.

Squeegee for Small Windows

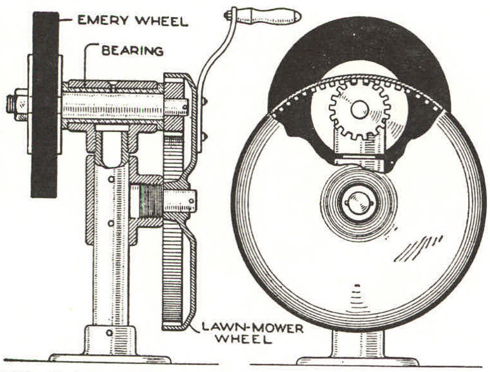
When washing the many small lights of glass in the windows of modern homes, it is generally found that the regular-size squeegee, or rubber wiper, is far too large to be of any use.



A good substitute can easily be made by cutting three or four strips, 1 in. wide and about 3½ in. long, from an old inner tube, and placing them in a spring paper clip in the manner shown in the drawing. On account of its small size, it can be easily carried in the pocket.

Emery-Wheel Grinder Driven with Lawn-Mower Gears

A substantial and practical emery-wheel grinder, to be set on the work-

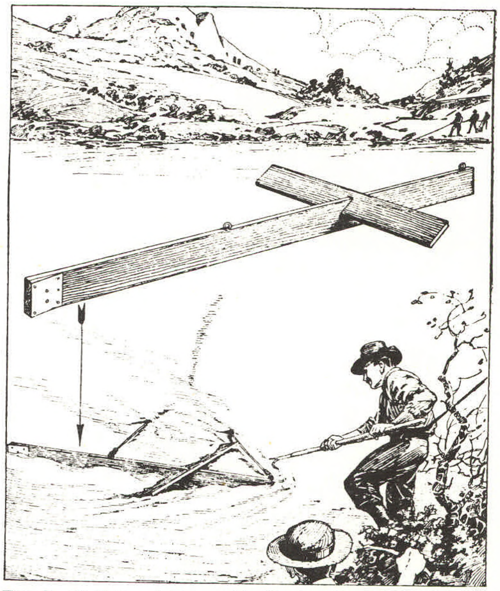


This Substantial Emery-Wheel Grinder was Made of Pipe Fittings and Parts from an Old Lawn Mower

bench, or on a special support, was made as shown, with gears from a lawn mower to transmit the power from the hand crank. The pinion, meshing inside of the internal gear, which was formerly the lawn-mower wheel, is set on a steel shaft, provided with a shoulder to receive the pinion. The opposite end of the shaft is shouldered and threaded to hold the emery wheel between washers and a nut. A steel pin holds the pinion on the shaft. The standard was built of a length of pipe and suitable fittings. A tee was used for the bearing, babbitt being cast into it in the usual manner. The bearings were provided with suitable oil holes, and the support riveted at the joints in the fittings, to insure stability.

Hydroplane for Carrying a Line across a Stream

The simple hydroplane shown in the illustration was the means of carrying

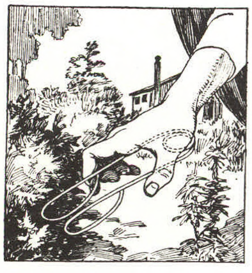


The Swift Current Drove the Hydroplane Onward and the Tension on the Line Forced It to the Bank

a line across a swollen stream after bridges and telephone wires had been torn away, in an Arizona valley. Cannon and rockets failed to carry a line over and two swimmers gave up the task. When a light line had been taken across by the hydroplane, rigged as shown in the sketch, a cable was drawn over and a ferry attached to it. In a short time reconstruction work was under way.

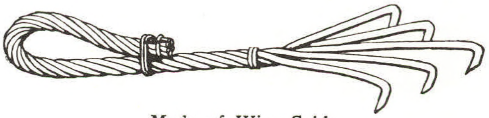
Forceps for Weeding Garden

Difficulty in removing small weeds around plants in the garden may be overcome by the use of a forceps made of a piece of wire, as shown in the illustration. The wire is formed into two loops by which the weeds are grasped, and the portion held in the hand is bent to form a circular spring. Its tension may be regulated so that the hand will not be tired in using the device.—Contributed by Irving McEwen, New Westminster, B. C., Canada.



A Garden Weeder

Take a piece of wire cable having five or more strands of wire and untwist one end for about 3 in. Spread the strands out and bend the end of each one at right angles, making the bend about ½ in. long. Bend the untwisted end of the cable so it will be double for 6 in. of its length, and tie them together. Also tie around the



Made of Wire Cable

cable at the base of the hooked strands. The illustration needs no further description. — Contributed by R. H. Workman, Loudonville, O.

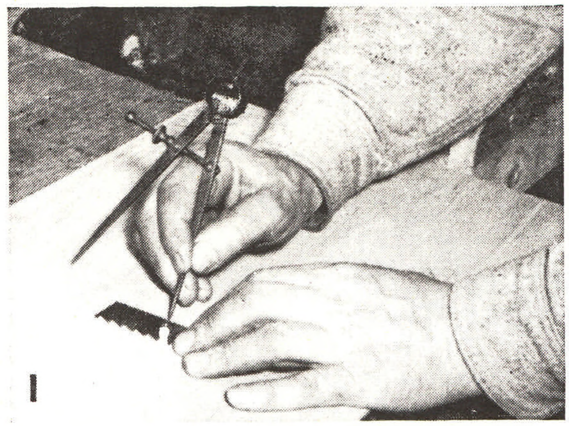
By R. A. NESS

Hand Scraper for Special Mouldings

ANY man with a woodworking shaper sooner or later is confronted with the task of making a short piece of moulding to match an existing shape, and with no knives or cutters suitable for the job.

For those who practice the art of knife-grinding at frequent intervals and become expert at it, fifteen minutes at the bench grinder may be enough to alter a similar pair of shaper knives to match the special shape. But for most home craftsmen the grinding of special knives is a complicated and tedious task of trial and error, taking a good deal of the fun out of shaper operation.

To such we recommend the making of a simple hand scraper, requiring nothing more than a few pieces of hardwood for a holder, and a short piece from a broken band saw blade for the knife. With these inexpensive materials and a few files and hand tools, we can be ready in fifteen minutes to duplicate the special moulding at a very nominal cost in time and effort.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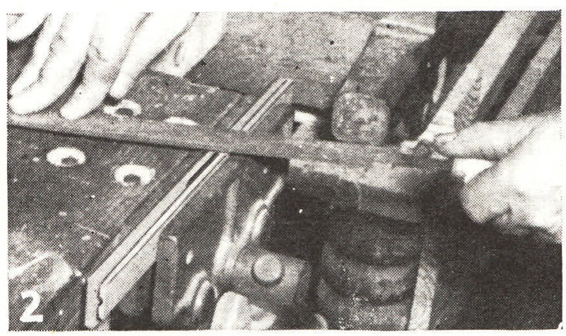
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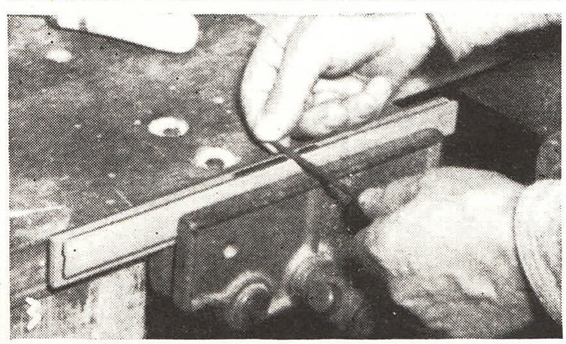
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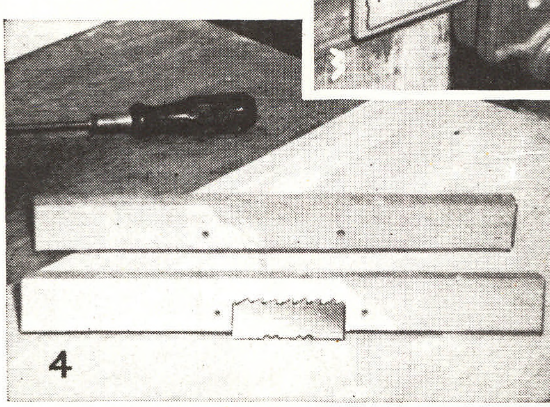
The advantage over grinding special knives for the shaper is in the fact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that band saw blades are only semi-hard, and can be hand filed to the desired shape in a short time and with relatively little skill.

The making of such a scraper is illustrated in the adjoining photographs. The first operation is to lay out the shape on the back edge of the band saw blade as shown in Fig. No. 1,

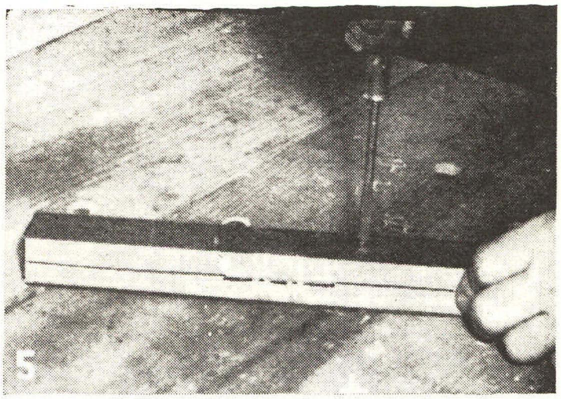
scratching the outline on the steel with a sharp tool such as one leg of the dividers. If a small cross-section of the desired moulding is available, this can be placed over the blade and traced.

Since the corners on the back edge of a band saw blade are slightly rounded, they will have no cutting action as a scraper. Operation two therefore is to put the blade in a vise between two pieces of wood, and file the back with a flat file to a straight and true edge. Next, with the use of round or suitably shaped files, file in the desired pattern as shown in Fig. No. 3. File straight across the blade, square with the surface.

Fig. No. 4 shows the patterned blade, and the holder to which it is to be fitted. Two pieces of hardwood, approximately ½ x 1 x 10", will serve for the holder. In one of these drill two holes on either side of the blade, large enough for a round head screw to slip through. Position this piece over the other and drill two smaller lead holes for the screws. With the blade positioned between these two pieces of wood, projecting below them for the desired depth of the pattern, screw them tightly together to hold the blade firmly in place (Fig. No. 5).

To guide our scraper on the sides of the stock to be moulded, brad two small pieces of wood on either side of the blade as shown in Fig. No. 6. The completed scraper in action is shown in Fig. No. 7. If the cut to be made is very deep, set the blade out only a short distance for the first several passes—after scraping this much in, advance the blade further for successive cuts. On large mouldings, where a considerable amount of stock is to be removed, it may be desirable to hog away some of the excess material with small cutters on the shaper—staying outside of the finished shape so that the scraper can then be used to finish up to the desired pattern with a minimum of hand work.

If a more permanent scraping tool is desired, shape the handles for a comfortable fit and attach two adjustable stops to the under side that can be brought up to each side of the moulding and tightened into position with screws instead of nailing them.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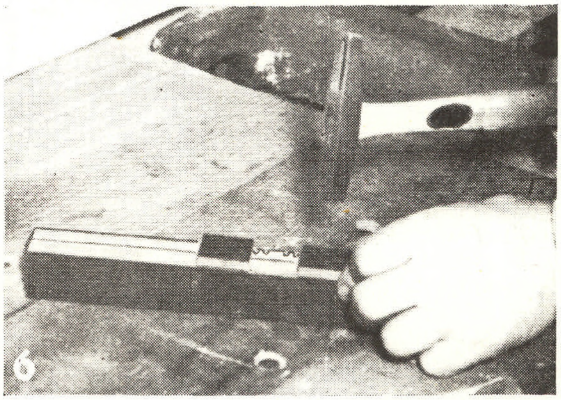
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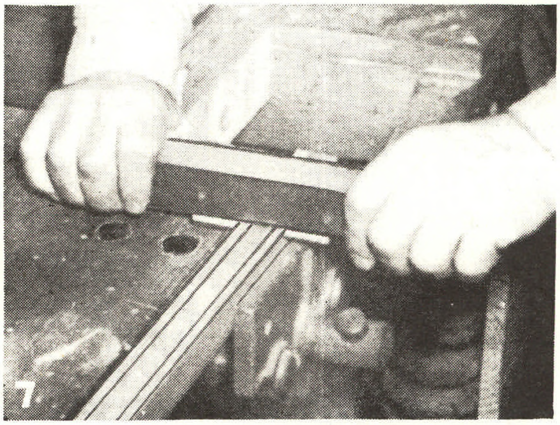
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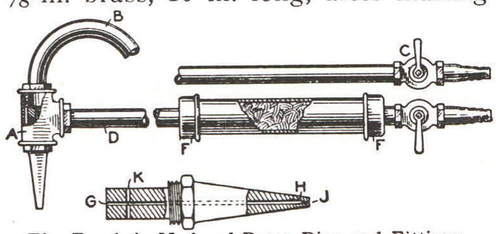
An Oxyacetylene-Welding Torch

A very simple torch for use with an oxyacetylene-welding outfit can be made as follows: Procure a brass tee, A, about $\frac{3}{4}$ in. in size, and bush one of the openings and the side outlet down to $\frac{1}{8}$ in. The upper pipe B is $\frac{1}{8}$-in. brass, 16 in. long, after making



The Torch is Made of Brass Pipe and Fittings, Only the Nozzle Requiring Special Work

the gooseneck bend in it, as shown. The bent end is turned into the bushing of the tee and a gas cock, C, is attached to the opposite end.

Another piece of $\frac{1}{8}$-in. brass pipe, D, 10 in. long, is turned into the side-outlet bushing. The end of this pipe is supplied with a filtering drum, which is made of $\frac{3}{4}$-in. brass pipe, about 4 in. long, with caps, FF, on the ends, the caps being drilled and tapped to receive the $\frac{1}{8}$-in. pipe. The drum is filled with mineral wool, and a gas cock is fitted to the end as in the upper pipe.

The tip, or nozzle, is made of brass or copper with a $\frac{1}{16}$-in. hole drilled from G to H, as shown, and a very fine needle hole from H to J. Two $\frac{1}{16}$-in. holes are drilled through the nozzle, at K, at right angles and crossing the hole GH, thus making four inlets to the center hole. Thread the outside to fit the $\frac{3}{4}$-in. tee. The end, having the crossed holes, should be just long enough to seat against the upper bushing and of sufficient diameter to permit this seating and yet provide a space between it and the body of the tee A. The assembled parts appear as shown.

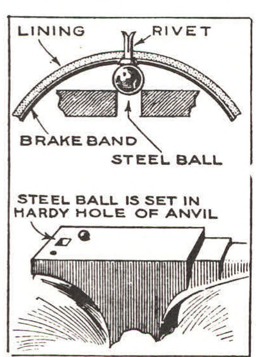
The oxygen is admitted through the pipe B, and this gas, having the higher pressure, helps to draw in the acetylene which is admitted through the pipe D at a lower pressure. The two are mixed in the tip and are forced out through the nozzle, where they are burned at a high temperature.

If care is taken to have the nozzle seat against the upper bushing tightly, so that no oxygen can escape except through the needle hole J, the torch will work as well as any made. The oxygen pressure should be from two to three times the acetylene pressure. The oxygen at 25 lb. and the acetylene at 10 makes a good, average working pressure.

To light the torch, turn on the acetylene, light it and keep turning the gas on until it burns steadily, then gradually turn on the oxygen until the flame becomes a clear white and cone-shaped, in the center of a blue flame. At this point it is ready for use.—Contributed by A. H. Waychoff, Lyons, Colo.

Brake-Lining Fixture

The usual method of riveting new lining to the brake and transmission bands of automobiles consists in clamping a punch in a vise, to back up the rivet while the head is being upset with the hammer. This requires considerable effort to keep the punch and rivet together. The idea illustrated by the drawing makes the riveting job somewhat simpler and requires nothing more than a large steel ball, placed in the hardy hole of an anvil. The rivet is set on this, and the end hammered over. The first blow makes a small depression in the rivet, and the ball rests in this.



Stop for a Workbench

Where only thick lumber is planed on a bench, a good stop can be made from an ordinary railroad spike. The overhanging head of the spike should be filed sharp and straight, and then saw-tooth notches filed in this sharp edge as shown in Fig. 1. The spike is

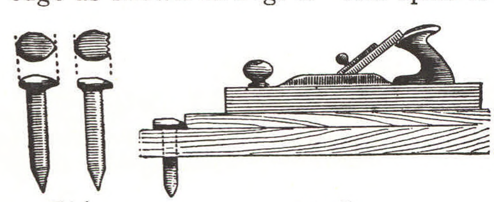


Fig. 1 Fig 2

Railroad Spike Stop

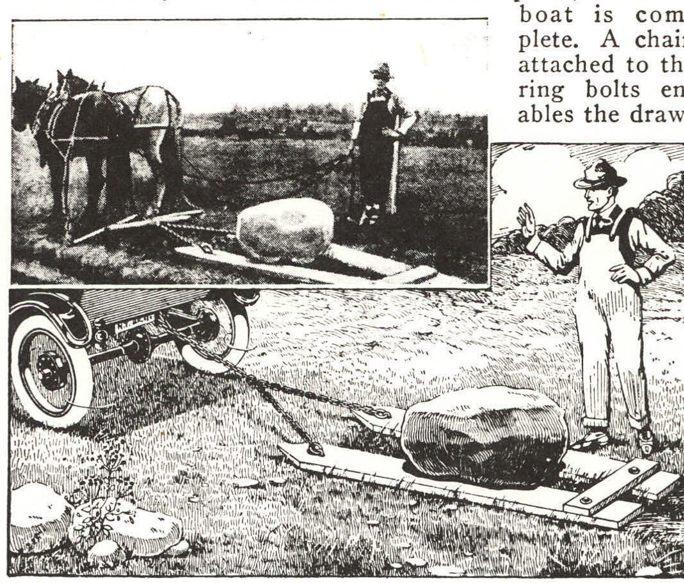
then driven through a hole bored in the top of the bench as shown in Fig. 2. The height can be adjusted as desired.

An Improved Stone Boat

For building garden walls, stone fences, laying foundations, or similar masonry work that requires the transportation of heavy stones or other weighty masses, the old stone boat can well be resorted to. The farmer perhaps appreciates the utility of this "vehicle" better than anyone, and he knows that it is easier to move heavy objects horizontally than vertically. However, the stone boat that is now helping the settlers of cut-over lands to avoid the dangers of hernia and strained backs in the clearing of their land, is built along different lines from the old type.

Large weights that are to be moved by a stone boat are usually dragged by a team of horses, yet one man can pull a surprisingly heavy object with it, and two men can make quite a showing; if handled carefully, a light car can also furnish the pulling power without undue strain.

The making of a stone boat of the type illustrated requires only two pieces of plank, about 8 ft. long, a wooden crosspiece, two straight bolts, and two ring bolts, together with the necessary length of chain. The planks are pointed at one end, and the two squared ends are bolted to the crosspiece, which should be of about 2 by 8-in. stuff and less than 2 ft. long. A space of several inches is left between the planks at the crosspiece, to permit the rear ends to move together when pull is applied to the forward ends. On fastening the ring bolts to the front end, about 1 ft. from the point, the stone boat is complete. A chain attached to the ring bolts enables the drawbar pull to be applied at a convenient distance from the pointed ends of the planks.

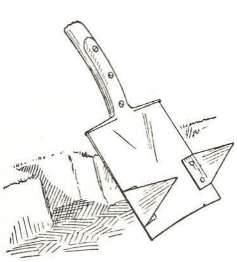


A Stone Boat for Moving Heavy Bowlders or Tree Stumps: This Type of Boat Itself Lifts the Load, Thus Relieving the Operator of Much Heavy Work and Clearing the Land More Rapidly

This particular type of stone boat works like a pair of scissors. Placed behind a stump or bowlder, it opens up as the pulling power forces its two pointed planks apart. As the pull is steadily applied the load is lifted or rolled onto the stone boat and then hauled away. Where a team, or other pulling power, is available the operator has no work except to adjust the pointed planks and the chain—this stone boat loads itself.—Mark G. Troxell, Madison, Wis.

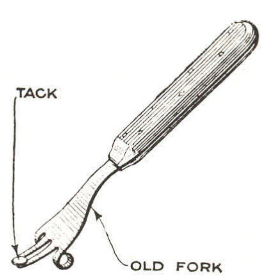
Side Cutters on a Spade

Two sections of an old mower cutter, heated and bent at right angles and riveted on the sides of a spade about 2 in. from the cutting edge, will prove a great help in digging garden and small drains. The spade will make a clean cut, and it is not necessary to jab the sides of the cut to be taken.—Contributed by A. S. Thomas, Amherstburg, Ont.



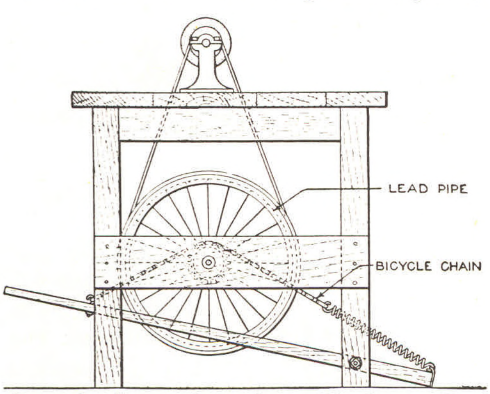
Old Fork Makes Tack Lifter

The drawing shows how an old fork can be converted into a simple and effective tack lifter. A four-tined fork is required for the purpose, and the tines are cut off to leave them about ¾ in. long; the outside tines are bent back underneath, as shown, to provide a fulcrum for the lifter, and the two center tines are filed off a little on the underside of each end so that they may be easily inserted underneath the tack heads.—C. A. Black, Jr., Hightstown, N. J.



High-Speed Foot-Power Grinder

An old bicycle wheel, weighted with a lead pipe around its rim, was used to provide a flywheel for the bench grinder shown in the sketch. The ratchet part of a coaster-brake bicycle hub was used for the axle and ratchet device. The axle was mounted in the brace at the end of the workbench, and the support for the grinder was set on the bench in line with the flywheel. A rope was used as a belt and runs in the grooved rim of the wheel. Holes were cut in the top of the bench to permit the rope belt to pass through. The ratchet device was arranged between the flywheel and the brace on the bench, a block being set against the brace to bring the ratchet out sufficiently to make room for the treadle. The latter was pivoted in the rear leg of the bench, and a section of bicycle chain fixed to it as shown, to act with the ratchet. A coil spring, like those used on doors, was fastened to the end of the drive chain and to the end of the treadle. The high gearing of the belt from the large drive pulley

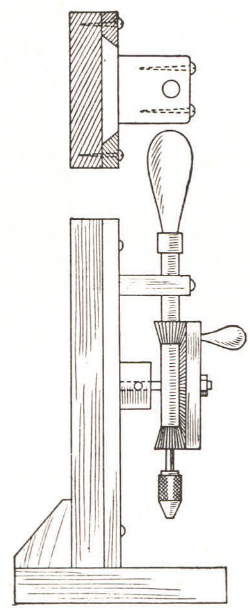


Parts of a Coaster Brake from a Bicycle were Used to Make This High-Speed Grinder, Fitted to the End of the Workbench

to the small one on the grinder gives great speed, which is desirable in a small grinder of this type.—N. Michels, Chicago, Ill.

How to Make a Small Vertical Drill

A small hand drill with a three-jaw chuck that will take the smallest drill can be purchased very reasonably. For ordinary work these drills do very well, but for comparatively deep holes, or when using long, slender drills, some sort of a stand should be made, if for no other reason, to avoid breaking the drills, which is almost invariably due to the side motion of the hand. There are other reasons, however, for making such a stand, and these lie in the fact that it is impossible to drill by hand at right angles with the surface of the metal, or to hold such a drill sufficiently steady to avoid widening the hole around the top.

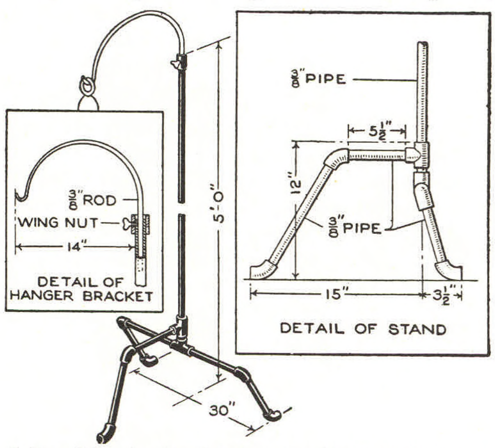


As each make of hand drill will require a somewhat different form of stand, no detailed description need be given of the one illustrated. The principal point is to have the base and standard securely set at right angles to each other, and then provide a smoothly sliding piece to which the hand drill may be clamped. The edges on this slide and the corresponding guides should be planed off to an angle of 45 deg. One of the guides should be adjustable, which may be arranged by elongating the screw holes and placing small washers under the heads of the screws that hold this guide to the main standard.

A neat little hand drill, arranged in this manner and firmly secured to the bench, may also be used for finishing the ends of small shafts, either flat or pointed, for polishing screw heads, etc., to all of which it gives that workmanlike appearance that can only be had when things are polished with a true rotary motion.—Contributed by John D. Adams, Phoenix, Ariz.

A Bird-Cage Stand Made of Pipes and Fittings

It is desirable that the pet canary, or other bird, usually kept indoors, be moved from place to place so that plenty of light and sunshine is afforded, and this can best be done by suspending the cage from a portable stand. Such a device was made of pipes and fittings, as shown, and proved serviceable and neat in appearance. The base is arranged in triangular form, so that the stand can be set close to a window or wall. The curved bracket is made of 3/8-in. iron rod, and slides in the top of the main pipe, as detailed. It is set by means of a wing nut. The base of the stand is built up of short sections of pipe with fittings, as shown. The angles at the floor should be plugged, and polished smooth, so as to slide easily over rugs, or on the floor. When the work of fitting the pieces together is complete,



A Stand for the Pet Bird can be Made in the Home Workshop of Pipes and Fittings

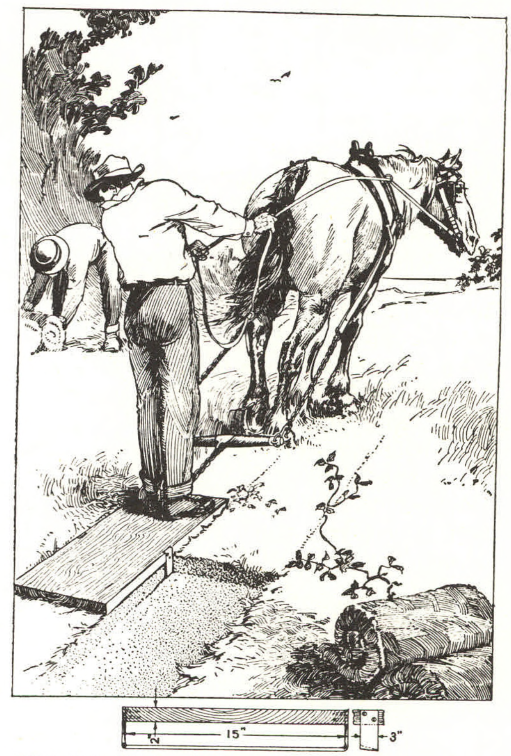
the stand should be wiped clean and finished with aluminum or gold-bronze paint.

ROADS IN IMPERIAL VALLEY PAVED WITH RAW COTTON

In the Imperial Valley, California, cotton has been employed as a road surface. Roads in the valley have been poor because the constant shifting of the sandy soil prevented the wearing of trails. The farmers discovered that raw cotton made an excellent road surface, cotton pods bedded down in the sand giving good traction. The cotton crops of 1919 and 1920 were of little value, and many miles of road were surfaced in this way.

A Horse-Drawn Sod Cutter

The cutting of a considerable area of sod is tedious work when done by hand, and it is difficult to make the sections of uniform thickness and size. These important features are provided for by the use of the homemade sod cutter shown in the sketch. To start a cut across a meadow or lot, a notch is cut in the turf for the blade, and the device is set into place, stamping it down to give a good start. The operator stands



With This Device Sod may be Cut Quickly and of Uniform Width and Thickness

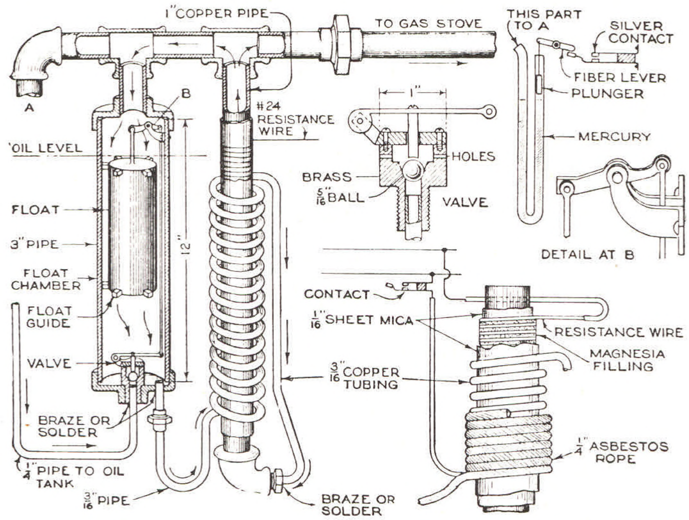
on the plank in front of the blade, and a little practice will soon determine the best position for ease in operation. When a cut has been completed, the cutter is dragged to a fresh starting place, the driver turning it over on the upper side. The strips are cut into suitable lengths and piled conveniently for removal with a stone boat or wagon.

The device may be made of any suitable width; 15 in. between the inner edges of the blade, and the latter set to cut a depth of about 2½ in., being desirable. The board is a 2-in. plank, about 4 ft. long. The blade should be set with the cutting edge slanting slightly downward so as to make the device "bite" into the ground. A smaller cutter may be made for use by boys, several of whom may draw it.—F. H. Sweet, Waynesboro, Va.

An Oil-Gas Generator

By A. N. CAPRON

WITH the coming of cold weather and its usual concomitant of low gas pressure, every user of gas will be interested in the simple attachment



An Easily Constructed Generator of This Type will Be a Boon to Users of Gas Who are Confronted with Frozen Gas Pipes or Reduced Pressure. It is Adapted to Generating Kerosene Gas and Is Self-Regulating

shown in the drawing, by means of which the shop stove can be converted into an oil stove when the gaspipes freeze—or when there is insufficient gas to go around.

It is well known that the vapor of kerosene oil, commonly known as coal oil, flashes, or can be ignited, when the oil is heated to from 120° to 140° F., but the oil will not produce gas in abundance until a temperature of 250° is reached. This can be demonstrated by filling a metal tube, 1 in. in diameter by 16 in. long, half full of kerosene and attaching a gas jet over the open end. By heating the kerosene in the tube the jet can be lighted, and it is upon this principle that the generator described herein operates—the cold oil enters one end of the pipe and comes from the burner as a gas or vapor.

The first item that will be required is a piece of brass or copper pipe, threaded at both ends. One end of the pipe is fitted with a reducing elbow and plug, as indicated. For a distance of 12 in. from the elbow the pipe is wrapped with a $\frac{1}{16}$-in. layer of sheet mica, and over this is wound sufficient No. 24 resistance wire, or ribbon, to produce a temperature of approximately 300° F. inside the pipe when connected across the supply main. The separate turns of resistance wire should be from $\frac{1}{32}$ to $\frac{1}{16}$ in. apart. The ends of the heating element are solidly fastened and brazed with silver solder to 12 in. of size 10 asbestos-covered lead. Rub some magnesia paste, made by mixing equal parts of powdered magnesia and plaster of Paris with water, or better still, the investment compound which can be obtained from dentists, between the turns to hold them in place. The whole coil is covered with a $\frac{1}{16}$-in. layer of mica. Twelve feet of $\frac{3}{16}$-in. annealed copper tubing will now be required. Keep 6 or 8 in. of one end free, and beginning $1\frac{1}{2}$ in. above the reducing elbow, wind the tubing around the insulated heating element, as shown in the drawing. Clamp the last turn to hold it firmly, and bring the loose end down to the plug in the reducing elbow. The brass plug is removed from the elbow and drilled through with a $\frac{3}{16}$-in. hole, counterboring, $\frac{1}{8}$ in. deep, with a $\frac{1}{4}$-in. drill. Screw in the plug with powdered graphite, measure the tubing to fit the hole in the plug, cut to size, remove the burr, and braze the end in the plug, this being facilitated by the counterbore. This joint must be oil and gas-tight. The entire assembly is now tightly wrapped with $\frac{1}{4}$-in. asbestos rope to within 2 in. of the upper end.

A piece of 3-in. brass or iron pipe with $\frac{1}{16}$ or $\frac{1}{8}$-in. walls, and caps to screw over the ends, are also needed for making the float chamber. The upper cap, as shown in the drawing, is drilled and tapped to take a 1-in. pipe, the lower cap being drilled and tapped with $\frac{1}{2}$ and $\frac{3}{16}$-in. openings. A cylindrical float, $2\frac{1}{4}$ in. in diameter by 6 in. long, is provided with 10 lugs or guides as shown in the drawing, to keep it centered in the float chamber without friction.

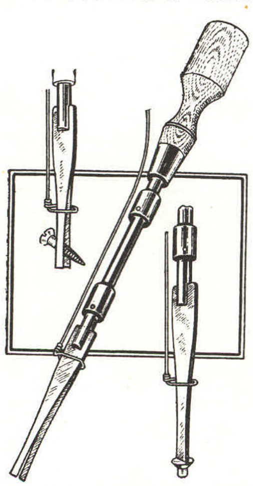
A valve is made, according to the detail drawing, from 1-in. round brass. The valve consists of two parts which are held together with screws, as indicated. The lower end of the valve is turned down to $\frac{1}{2}$ in. and threaded to fit the

hole in the bottom cap of the float chamber. The valve is countersunk with a countersinking drill, or rose countersink, to provide a seat for a 5/16-in. steel ball, which acts as a check valve in preventing hot oil from backing up into the supply tank. The upper half of the valve is drilled as in the drawing, and the lever is attached; the metal rod which presses against the ball being fastened somewhat loosely in the lever, to permit sideplay. Quarter-inch pipe is used to connect the oil tank with the valve, and the pipe should be sweated to the former after assembly. The oil supply should be placed from 5 to 8 ft. above the valve. A short piece of 3/16-in. tubing is soldered into the remaining hole in the bottom cap of the valve chamber, and a union is attached for connecting the remaining loose end of the copper coil, in the manner shown. The heating coil and the float chamber are connected together by the simple piping arrangement shown, and if the automatic cut-out, to be described, is not used, the end at A is plugged.

The automatic cut-out, which is connected to the end of the pipe at A, consists of a U-shaped metal or glass tube, half-filled with mercury, which acts on a fiber plunger inserted into the free end of the tube so that, when the pressure causes the mercury to rise, it will actuate the lever and open the heating circuit, automatically relieving the pressure, and as the pressure falls, the electrical contact is again established, the operation being automatic. The oil flows into the float chamber through the valve from the gravity tank. As the float chamber becomes filled, the float rises, which forces down the plunger and cuts off the supply. After sufficient pressure has been generated, the pressure forces the mercury in the U-tube up, and the current is cut off from the heating coil. At the very worst, if anything should fail, the mercury will be forced out of the tube which performs the function of a safety valve.

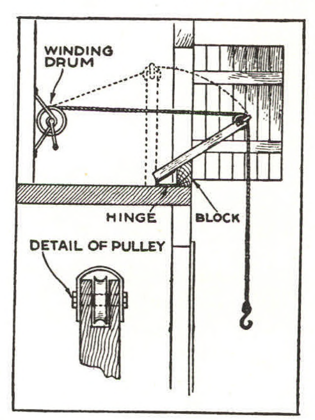
Screwdriver Grips Small Screws

The screwdriver shown in the sketch was devised when I found that I could not reach into a corner of a cash register with an ordinary screwdriver. The tip was made from a pair of tweezers. The shank may be provided in various lengths, and the wire shown may be used to clamp the tweezers when it is desired to lift a screw out of an otherwise inaccessible place. If the strips of the tweezers are given the proper spring they will hold small screws firmly while they are put into place. The tips should be kept sharp and square. —Contributed by W. C. Loy, Rochester, N. Y.

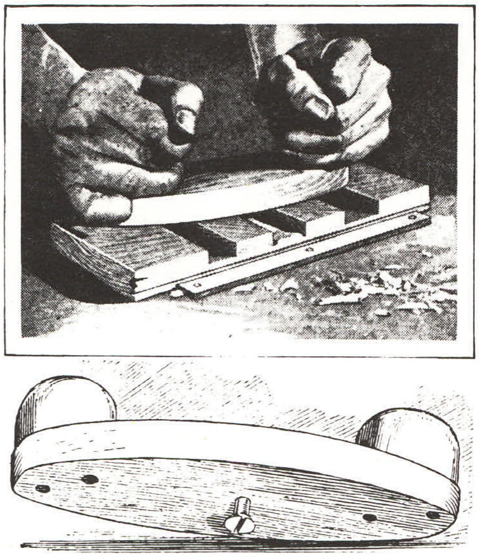


A Simple Farm Hoist

A simple hoist that will find many uses about the farm, for raising bags of grain and other bulky weights to the upper floor of a barn or other building, is shown in the drawing.



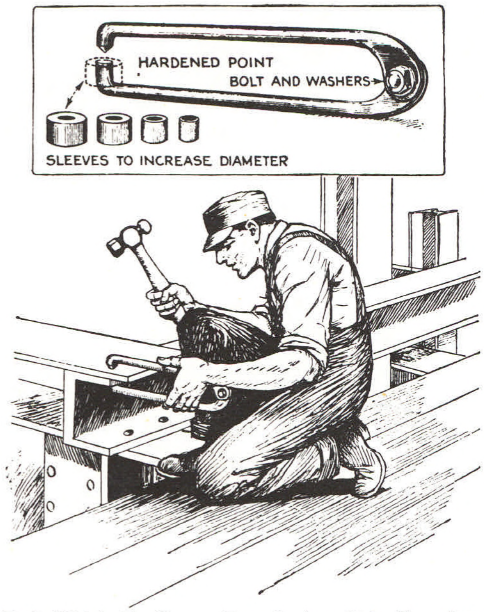
A wooden beam, of suitable thickness and length, is hinged to the floor at a convenient point inside the door or other opening. The upper end of the beam is provided with a single-sheave pulley, over which the rope passes to the winding drum; this can be easily improvised. A wooden block can be made and inserted underneath the projecting beam so that the arm is held in an inclined position, as shown. The packages are raised clear of the building and, when they reach the pulley, swing inward as the arm rises to a vertical position.



Block of Wood Fitted with Two Handles and a Sharp-Edged Screw Makes a Good Router

Simple Homemade Router

For the home mechanic who has only a few tools, the router illustrated herewith will be found convenient. It consists of a suitable oblong block of proper length, fitted with a handhold at each end and a screw on the underside, projecting the same distance as the depth of the routing. The screw head is filed to a sharp edge so that it will cut through the wood readily.—E. K. Wehry, Cedar Rapids, Iowa.



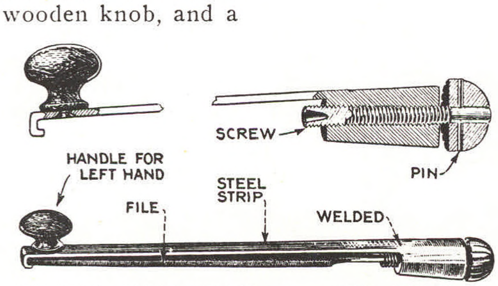
Tool Which Facilitates Transferring Hole Locations from Channels and I-Beams

Tool for Transferring Hole Locations

In structural iron work, there are many occasions to transfer holes from I-beams, channels or built-up girders, to plates or adjacent material so that it may be drilled with coincident holes. The restricted space on the I-beams, etc., which does not allow for the use of a drill to locate the holes by drilling through, is the obvious reason for transferring them to the top of the plate. An excellent tool for this use was developed by a worker and is shown in the illustration. It is made up as a caliper, consisting of two hinged legs, which work on an accurately fitted pivot. One leg terminates in a hardened-steel point that is used as a center punch. The other leg is made up as a plug to engage the hole in the work to be transferred. Steel thimbles are used to increase the diameter of the plug to correspond to the work. In accuracy, the tool will be found entirely satisfactory and it will save considerable time.

Handy File Holder

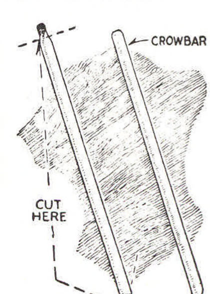
One of the most used and abused tools is a file, and it is often found without a handle. The holder shown in the illustration will not come off and is much handier to use than the usual type. It consists of a length of flat iron, bent at one end to form a hook which is caught over the end of the file, and the other end of the iron strip is welded to a tapered piece of steel, as indicated. The latter is tapped lengthwise for a screw, which is anchored in a small wooden knob, and a hole is drilled in the other end of the screw to accommodate the pointed tang of the file. In use, the file is slipped into the holder, and the wooden knob is turned until the file is held securely.



File Holder Which Will Not Come Off and Is Handy to Use

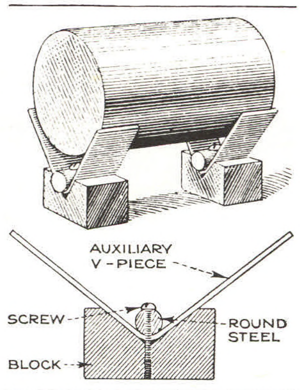
Old Driveshaft Makes Good Crowbar

A strong crowbar, which cannot be bent by the combined efforts of two men, may be made from a discarded driveshaft of a model-T Ford. The threaded end is cut off and the rough spot filed or ground down so that it will be easy on the hands, while the other end is cut off at an angle as shown.—J. A. Blaker, West Auburn, Mass.



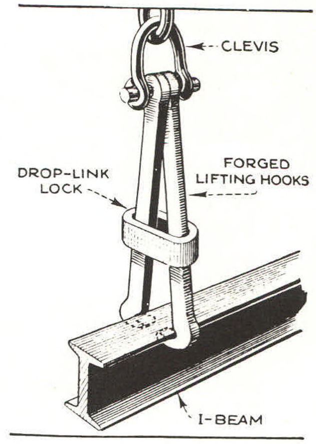
Increasing Capacity of Small V-Blocks

To eliminate the necessity of carrying around heavy V-blocks, a mechanic devised the auxiliary pieces shown in the photo so that a small pair of V-blocks could be used on light work of a diameter much larger than the blocks were intended for. The auxiliary V-blocks are made of flat-finished stock and they are held to the regular blocks by means of two pieces of round steel, drilled in the center to clear round-head screws, which thread into tapped holes in the center of the blocks. The auxiliary pieces can be attached or removed in a moment; for light work they are just as handy as heavy blocks, and, of course, the difference in bulk and weight makes them most desirable when they have to be carried around in a tool kit from one job to another.



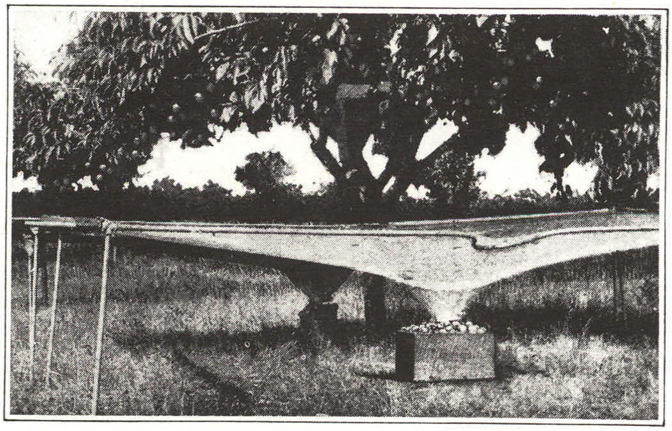
Lifting Tongs for I-Beams

In shops where many I-beams are handled on hoists or cranes it is customary to hold the beams by means of chain slings, but it takes considerable time and labor to attach these slings so that they will not slip. In one shop the work was greatly facilitated by the use of the tongs shown in the drawing. These could be attached and detached in a fraction of the time consumed in adjusting the sling, and they were just as safe as the latter, as they were self-locking. They consist of two forged lifting hooks having holes drilled at one end to slip on the pin of a heavy clevis, which is attached to the hoist, and having the other end bent over at right angles to grip the I-beam. A drop link holds both hooks on the beam.



SIMPLE FRUIT COLLECTOR SAVES LABOR

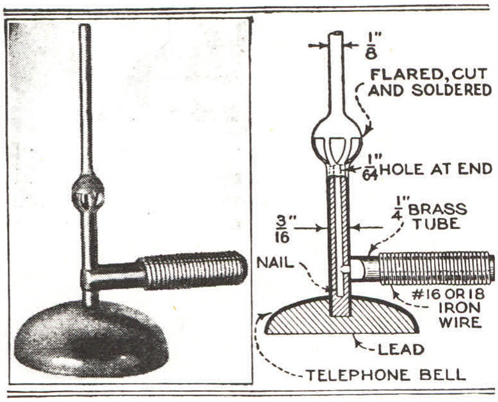
A fruit collector designed for harvesting prunes, but which can be used for other fruits also, consists essentially of a netting to be spread under a tree and onto which the fruit is shaken. The netting is supported above the ground by a frame of ½-in. iron pipe, measuring 7½ by 15 ft. Two such frames, set side by side, are used under one tree. A curve in one side of each permits them to be fitted closely about the trunk. The mesh can be of such size as to allow small fruit to fall to the ground. The netting is so slanted that the larger fruit rolls to an opening in the net's center and thence into boxes or pails. In this way it is kept out of the dirt. The frames can be folded up and moved easily. The device is patented. It is claimed that four persons with two collectors can shake and harvest as many prunes as 12 persons can by the old method of shaking and gathering from the ground.



All Fruit Shaken onto This Collector will Roll into the Receptacle Placed beneath the Opening Except the Small, and Hence Undesirable, Fruit Which will Fall through to the Ground

Small Homemade Bunsen Burner

Amateur mechanics and jewelers will find a small bunsen burner of the kind shown in the illustration of considerable



Left, Photo of Homemade Bunsen Burner; Right, Details of Construction

usefulness. It can readily be made in a short time from material always available.

The base consists of an old alarm-clock or telephone bell filled with lead. A short length of $\frac{3}{16}$-in. brass tubing has a $\frac{1}{4}$-in. nipple soldered at right angles to it as shown, and a nail, drilled lengthwise and driven snugly into the tube, is inserted through the screwhole of the bell and into the lead, when the latter is still molten. A good way to fill the bell with lead is to set it on a flat surface and pour the lead in through the screwhole. A length of iron wire is wrapped around the $\frac{1}{4}$-in. nipple and is sweated on with solder; this provides an excellent grip for the rubber tubing, and prevents it from slipping off. The hole drilled through the nail must be very small and exactly in the center so that a very small jet of gas is passed through the center of the upper part of the burner. A small hole, breaking into the vertical one, is drilled through the side of the tube, in the center of the nipple. The size of the hole in the end of the nail is decreased by tapping on it until it is about $\frac{1}{64}$ in. in diameter; if made too small, it may be enlarged by reaming. The upper end of the brass tube is flared out and slots are cut in it as indicated, by means of a small jeweler's saw. A 2-in. length of $\frac{1}{8}$-in. brass tubing is also flared out at one end and this end is soldered to the top of the other piece, which completes the burner.

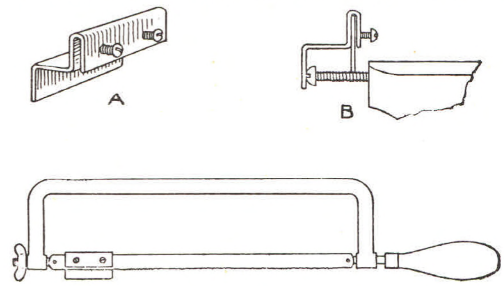
A fine drill made from a needle

A Drill Made from a Needle

SMALL drills for watchmakers can be made from needles which are tempered, filed at one end to the usual shape of a drill point, and fitted at the other end with a small brass or copper handle.

Guide for a Hacksaw Blade

Cutting a screw with a hacksaw to make it shorter is a very tedious and unsatisfactory method, as the teeth of the saw blade are liable to jump over a thread after making the measurement so that the screw will be cut either too long or too short. If there are many screws to be cut a certain length, make a gauge, as shown at A, for the saw blade and all screws will be measured and cut alike. The gauge is fastened on the front end of the saw

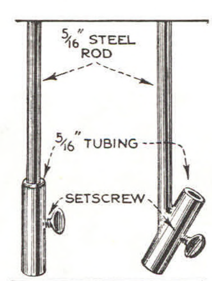


The Gauge as It is Attached to the Saw Blade at the Front End

blade and used in starting the cut, as at B, after which the cut is finished in the usual manner.—Contributed by Joe V. Romig, Allentown, Pa.

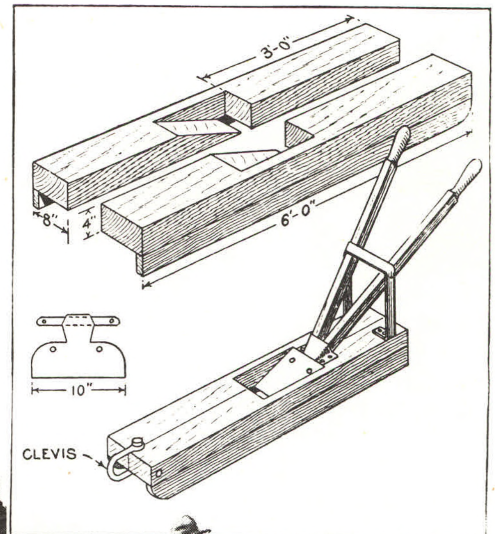
Welding-Rod Holders

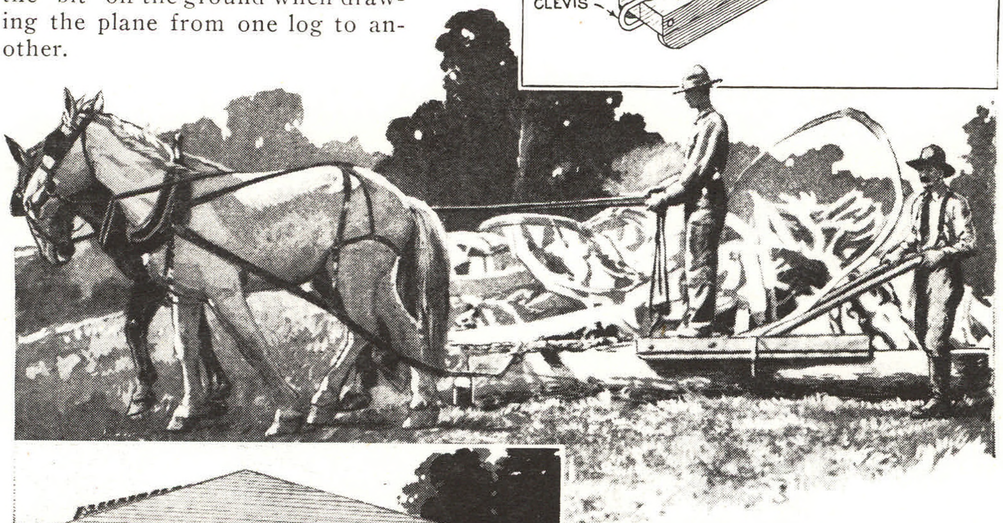
Every acetylene welder who does heavy work on large preheated jobs knows how disagreeable the work is when ordinary short welding rods are used. As a makeshift, lengths of short rod are often welded together, but this is not entirely satisfactory because the workman cannot then hold the end of the rod on the weld so steadily. In order to overcome this trouble welding-rod holders of the kind shown in the illustration have been made in one shop and found entirely satisfactory. They are made from lengths of $\frac{5}{16}$-in. round steel rod and short lengths of $\frac{5}{16}$-in. tubing having a $\frac{1}{16}$-in. wall, the tubing being welded to the end of the rod, either in line with it or at an angle to it as indicated: one type of holder will be found suitable for one class of work, the other for work of another kind.—Edwin Kilburn, Spring Valley, Minn.



HORSE PLANE WITH BROADAX BIT SQUARES LOGS

When we want to hew logs to shape, we save labor by making our horses provide the power for our "planing mill." The plane consists of a 4 by 8-in. by 12-ft. plank, sawn in two to make a block 6 ft. long. Each piece has a slot cut in it as shown in the drawings, and back of the slot a seat is cut to form a bed for the plane bit, which is a common broadax. The slope of the bed is made to suit the bevel of the ax, the lower bevel being almost parallel with the bottom. The planks are fastened together with three 1-in. dowels and a piece of pipe, the latter being used as a dowel at the front end. Two runners are nailed to the sides of the block to keep the "bit" off the ground when drawing the plane from one log to another.



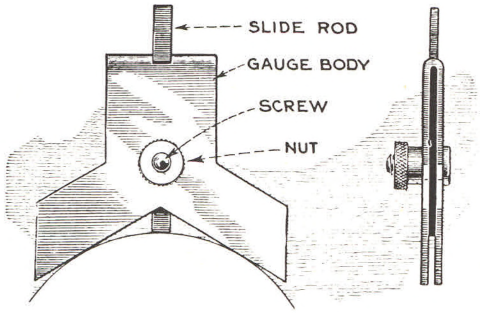


Log Plane Uses Horses as Power and Broadax as Bit; Left, Canadian Ranch House Built of Logs Hewn with the Plane

The ax is held in place with four bolts, two holes being drilled in the shoulder of the ax and a piece of ⅜ by 1-in. flat iron driven through the eye for the other two bolts. The nuts and washers are counterbored into the underside of the block.

We hew two logs at a time, running the plane down one log and then back on the other, to save time. In most cases it is necessary to set a short post in the ground in front of each log to take the thrust. The shavings should not be more than ⅜-in. thick, and, of course, the wider the blade of the ax the bigger the logs that can be handled.

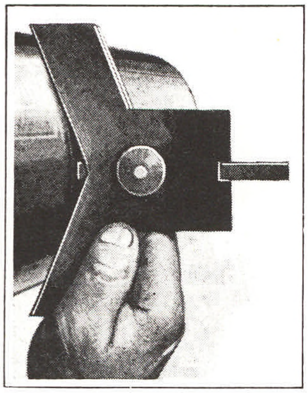
Shakes can easily be made by sawing across the log. We hew from twenty to thirty logs a day, and the shavings, when dried, make excellent kindling.—Eden W. Robinson, Bear Flats, B. C.



Handy Gauge for Duplicating Diameters Where Regular Calipers Cannot Be Used

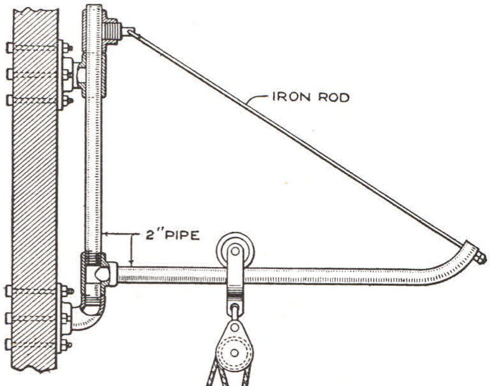
Gauge for Duplicating Diameters Takes Place of Caliper

An unusual type of gauge that I have found handy on repair work is shown in the photo. It is not always possible to caliper a size when duplicating a piece, owing to obstructions caused by the piece being in place on a machine, or perhaps an auxiliary part fitted to it after it was turned. If I cannot get the calipers on a job, I use this gauge. It is made by bending a piece of sheet metal double and cutting it a V-shape on the contact end. A slot is then filed on the top to take a sliding rod, which is made of the same stock. A nut and screw, similar to those used on a depth gauge, complete it. For duplicating a diameter, the gauge is placed on the old piece and the slide rod is pressed down until it touches the surface; then the nut is tightened to hold the rod immovable and the new piece is turned until the gauge fits it in the same way.—Harry Moore, Montreal, Can.



Wall Crane for Small Shop or Garage

In garages and machine shops where it is necessary to handle heavy machine parts, a small crane saves much time and effort. The illustration shows a wall crane, built largely of 2-in. pipe and fittings, that can be made readily, and has a wide range of use if properly located on the shop wall. The dimensions may be varied to suit special conditions, and a length of about 10 ft. for the arms is satisfactory. This size will lift objects weighing up to 1,000 lb. with safety. The arms of the bracket are fitted at their upper and lower ends into tees, to form a right angle, and to give a fastening at the top for the brace, which is an iron rod. It is fixed at its upper end to a plug screwed into the tee, and at its lower by bolting it to the turned-up end of the horizontal member. The vertical support is carried at its lower end in an elbow, and near its upper end in a tee, fitted into a flange and bolted to the wall. A suitable trolley and tackle may be provided either by making the pulleys and fittings or purchasing them.—Thomas W. Benson, Philadelphia, Pa.



This Wall Crane, Made of Pipe and Fittings, will Carry a Load Up to 1,000 Pounds, if Carefully Made

Handy Wagon Brakes

When climbing long grades with a heavy wagon, the horses must be given an occasional rest, but in most cases they must even then hold the weight of the load against the tendency of the wagon to roll down. One farmer, realizing that his horses, due to this strain, were not getting the full benefit of the rest, provided a brake on the rear end of his wagon as shown in the drawing. It consists of a stout piece of wood, securely hinged to the rear end. A rope was attached to the end of the brake and was slipped over the back

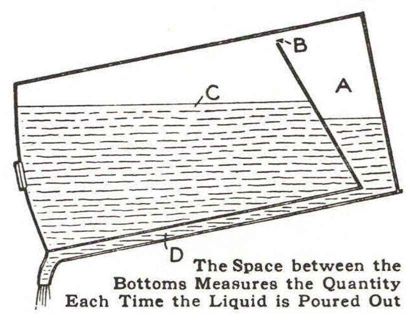
Brake on Wagon Relieves Horses of Heavy Load While Resting on Long Grade

of the wagon to the driver, enabling him to raise or lower the brake at will.—Frank S. Reynolds, Ft. Morgan, Colo.

A Measure within a Liquid Receptacle

The sketch shows the construction of a can from which only a certain amount of liquid can be poured out, although it may hold many times that quantity. The can may be of any shape desired. At a distance above the bottom of the can on the inside is placed another bottom in a sloping position as shown. The opening to admit the liquid into the space A between the bottoms is at a point diagonally opposite the outlet, or at B. The liquid in the main part of the can C runs through the hole B and fills the space A. When tipping the can to pour out the liquid, only that portion contained in A can run out through the spout D. The distance between the bottoms determines the amount of liquid in the measuring portion A.

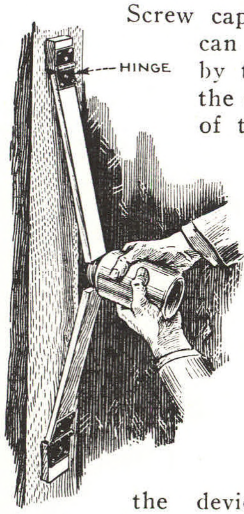
If it is desired to measure a pint of



The Space between the Bottoms Measures the Quantity Each Time the Liquid is Poured Out

liquid at a time, the location of the dividing bottom may be determined by placing a pint of liquid in the can and tipping it to obtain the slope, then marking the level line on the sides of the can.—Contributed by J. A. Scalella, Philadelphia, Pa.

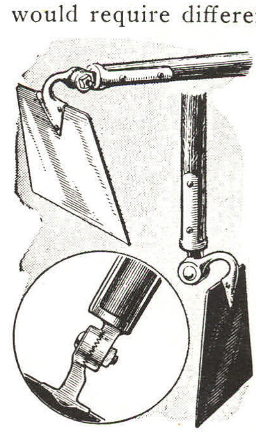
Loosening Screw Caps



Screw caps on cans and jars can readily be loosened by the device shown in the drawing. It consists of two pieces of wood, 3 by ¾ by 24 in. in dimensions. These are fastened vertically with two hinges to any stout wooden facing, as shown. The device will grip a can of any size, even the lid of a fruit jar. The pressure on the cap increases as the device approaches the closed position.—L. Pyle, Laporte, Pa.

HOE WITH ADJUSTABLE HEAD SAVES EXTRA TOOLS

Garden and field tasks that ordinarily would require different tools for satisfactory performance can be done with a hoe that has an adjustable head. It can be turned to any position simply by loosening a bolt. By virtue of this arrangement, it can be used for plain hoeing, scraping, weeding or trimming the edges of turf and similar purposes.



Revolution Counter Useful in Coil Winding

A small revolution counter, or speed indicator, attached to the winding jig, as suggested in the drawings, makes accuracy certain in counting the number of turns when winding electric coils.

As the lathe is usually used for medium and heavy coil winding, Fig. 1 shows how the counter may be attached to a wooden bushing driven into the hollow lathe spindle. If the spindle hole is not large enough, or not hollow, a wooden coupling can be fitted over the spindle instead of into it, as in the detail. If the counter is in good working order, there should be no tendency for it to rotate with the lathe spindle; if it does, a small clamp will act as ballast, as indicated. When a lathe is not available, hand turning must be resorted to. Figure 2 shows an extremely simple rig for fine-wire coils; the spool is driven directly on the counter spindle. The counter may be clamped in a vise or to a bench, and a handle is fastened to the spool, for turning by hand. To speed up the winding, a hand drill with the spool held in the chuck is frequently used, the drill being clamped down or held in a vise. Such an arrangement is shown in Fig. 3. While the counter is usually clamped to the bench, the same as the drill, it may be allowed to swing free, as suggested in Fig. 1. In Fig. 4 is shown a simple type of winding jig, rotated by a crank handle, while the counter is attached through a hardwood coupling to the other end of the winding shaft; a wood post keeps it from turning.

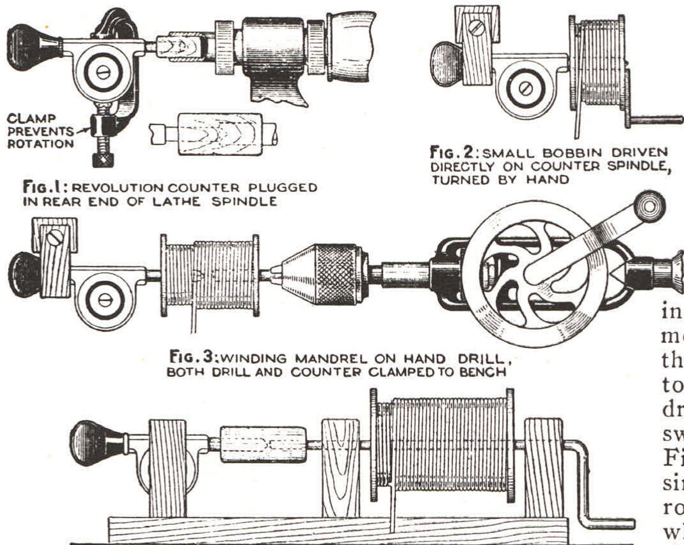


FIG. 1: REVOLUTION COUNTER PLUGGED IN REAR END OF LATHE SPINDLE

FIG. 2: SMALL BOBBIN DRIVEN DIRECTLY ON COUNTER SPINDLE, TURNED BY HAND

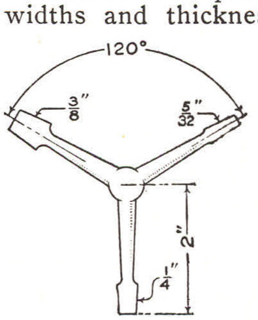
FIG. 3: WINDING MANDREL ON HAND DRILL, BOTH DRILL AND COUNTER CLAMPED TO BENCH

FIG. 4 ATTACHED TO WOODEN WINDING JIG

Various Arrangements are Illustrated by Which an Ordinary Speed Indicator, or "Revolution Counter," may be Used to Keep Accurate Count of the Turns of Wire When Winding Coils

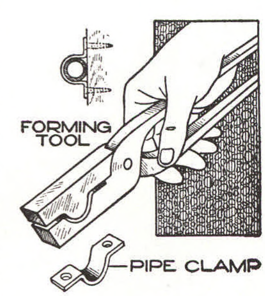
Handy Form for a Screwdriver

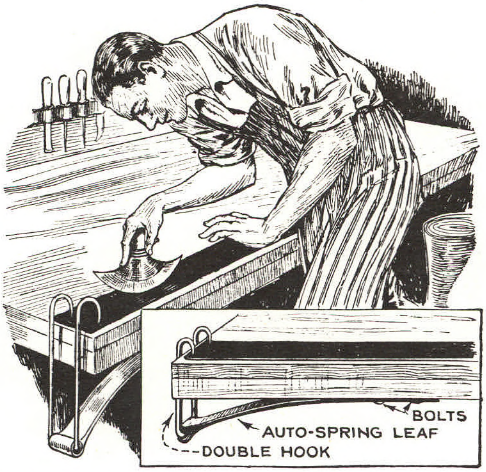
Screwdriver points of different widths and thicknesses are a necessity on many classes of work. The sketch shows how a three-pointed driver can be easily hammered out of a small piece of steel. The two points not in use furnish an excellent leverage for the work the point in use is being applied to. For a very handy little homemade tool of this nature it is hard to beat.



Forming Tool for Pipe Clamps

The sketch shows a pipe clamp shaped from light steel, and a handy tool used to form it. To use the tool, which is made in the form of a pair of tongs, it is opened and the straight piece of steel to be formed is inserted. The upper part of the forming tool is then struck a blow with a hammer, and the clamp is formed.





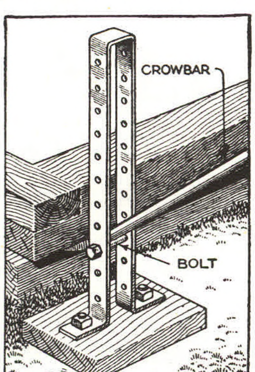
A Strong and Convenient Strap Holder Is a Timesaver for the Harness Repair Man

Clamp for the Harness Repair Man

Belt makers, harness repair men and other tradesmen who have to work with leather, rubber or fabric strips on a bench, will find the illustrated spring clamp very useful. The leaf of a discarded auto spring is bolted to the underside of the workbench at the end most convenient, and, through the eye of the spring, is fastened a double hook made from a length of $\frac{3}{8}$-in. round steel with the ends sharpened. When splitting or trimming a belt or strap, it is placed flush with the end of the bench, as shown, the hooks being raised and then released to hold the strip securely at the far end, while the other is kept immovable by the left hand.

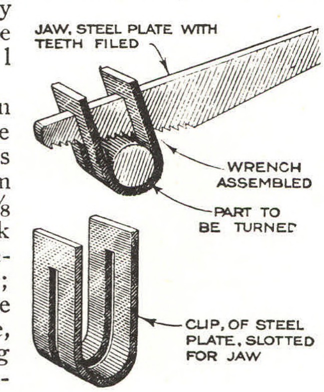
Adjustable Crowbar Fulcrum

The drawing clearly shows the construction of an adjustable crowbar fulcrum made from a piece of old $\frac{1}{4}$ by $2\frac{1}{2}$-in. flat iron. The iron is bent into the shape shown, a space of about 2 in. being allowed between the sides. The feet, which are bent at right angles to the upright part, are drilled for attaching the device to a block with bolts. The sides are provided with holes at $2\frac{1}{2}$-in. intervals through which the bolt supporting the crowbar is inserted.

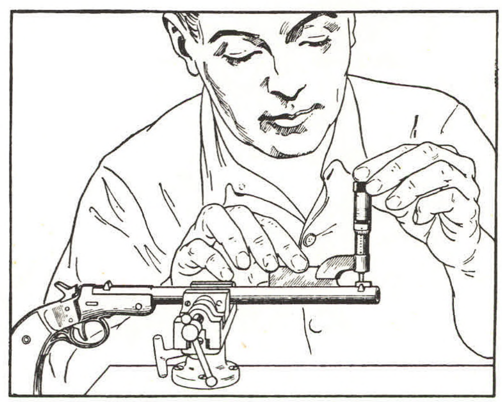


A Simple Pipe Wrench

Where a heavy pipe wrench is only occasionally used, the small shop owner can make a very serviceable one from steel plate.



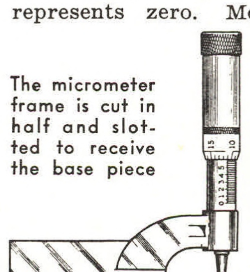
As shown in the sketch, the toothed jaw is made from plate steel, $\frac{3}{8}$ to $\frac{1}{2}$ in. thick and of any required length; the teeth are cut with a file, the working face being tapered. This face should be hardened before the tool is used. The U-shaped clip is of $\frac{1}{4}$-in. plate, bent and slotted to an easy fit for the jaw.



Old Micrometer Converted into a Special Gauge

For certain types of precision work in the shop, a useful height and depth gauge may be made from an old 1″ micrometer. One use of the tool, for example, is checking the height of gun sights.

The frame of the micrometer is cut as shown, and a base added by soldering a piece of steel in a slot sawed into the frame. A soldered joint is secure enough, as a tool of this type is not subjected to any abuse. The base is set so that 0.500″ on the scale represents zero. Measurements may be made from $\frac{1}{2}$″ above to $\frac{1}{2}$″ below zero. Other arrangements are possible to suit special needs; for instance, the gauge might be adjusted so it reads up to 1″ high or 1″ low.—M. L. B.


The micrometer frame is cut in half and slotted to receive the base piece

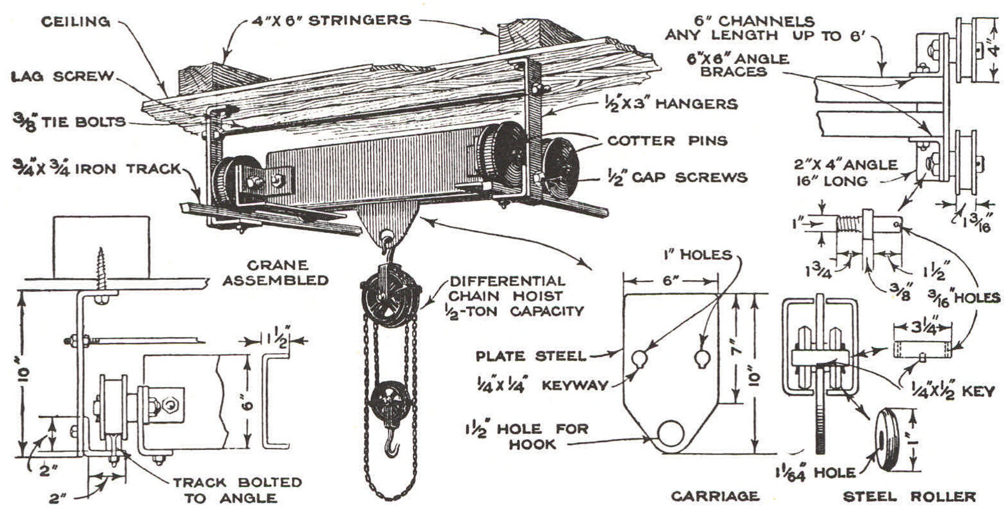
A Half-Ton Traveling Crane

By J. V. Romig

THERE are many places where a small traveling crane can be used to advantage, such as small ice-making plants, shipping rooms, storage warehouses, etc., but where the cost of such an aid is a very big factor; to such places, the crane illustrated will prove a boon, as the various parts required in the assembly are usually to be found in the shop.

First, plan the exact location of the track; its length, width, and height from the floor; with these dimensions at hand, proceed to lay out the design of the various pieces. The dimensions shown in the drawing are suitable for a crane up to 6-ft. span. The channels which form the bridge are placed with their webs out, and the flanges about ¾ in. apart. The endpieces are of 4 by 2-in. angle iron, with 1-in. holes drilled in the 4-in. flange for the trolley-wheel pins. These endpieces are fastened to the channel irons by braces made from 6 by 6-in. angle iron, 3 in. wide, one leg of the brace being bolted to the channel iron, while the other is clamped to the endpiece by the nut of the trolley pin. The trolley wheels, carriage rolls, trolley pins, and roll pins are turned from cold-rolled steel to the dimensions shown, the roll pins having a small feather key in the center which fits a keyway in the carriage plate. The carriage plate is made of ½-in. boiler plate, drilled for the roll pins and for the hoist hook.

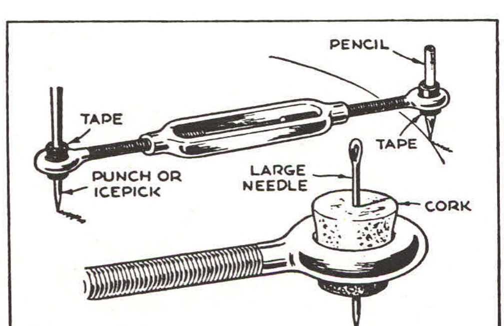
When the crane has been assembled, measure the gauge of the trolley wheels, and put up stringers corresponding to this measurement, to carry the tracks. The track members are made up of ¾-in. square machine steel, bolted to pieces of 2-in. angle iron, which in turn are bolted to the ½ by 3-in. hangers. These hangers are fastened to the stringers by lag screws or bolts, and are braced as shown, by ⅜-in. tie bolts; the hangers should be spaced about 3 ft. apart. The crane is completed by the addition of a ½-ton hoist. By seeing that the track is level, and the trolley wheels and carriage rolls oiled at frequent intervals, a light-running crane will be the result, which will more than repay the labor of building it, by the saving effected in handling costs.



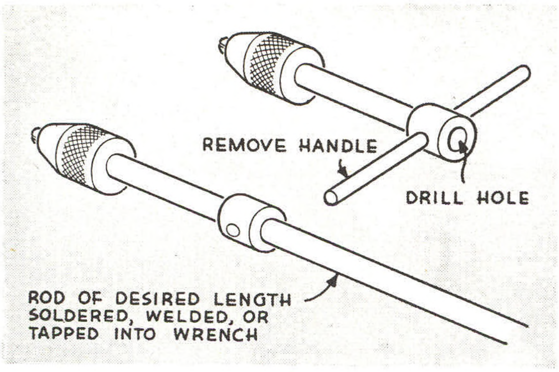
A Light-Running Crane, Which will Add Greatly to the Ease of Handling Materials in a Small Shop, is Easily Constructed of Available Materials

Turnbuckle Serves as Compass for Drawing Large Circles

WHEN large circles are required in a layout and a beam compass or dividers adequate for the task are not available, an ordinary turnbuckle can be put to good use. Adjust it to the desired radius and insert a punch in the pivot end and a pencil in the other. Tape may be wound on these for better accuracy, or corks put in the holes and big needles pressed through.—BENNETT LEWIS.



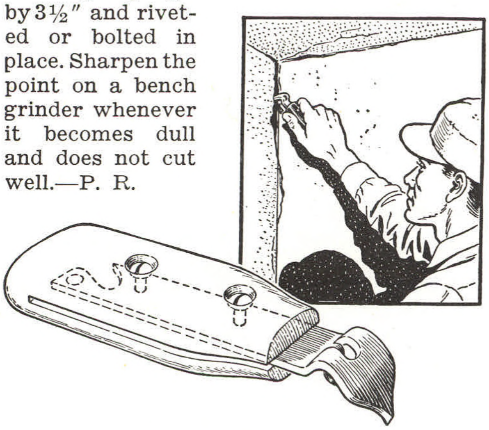
Tap Wrench and Length of Rod Form Handy Drill Extension



A DIME-STORE tap wrench and a length of welding rod, drill rod, or similar stock 3/16" or 1/4" in diameter will make a convenient extension for use in an electric or hand drill. Remove the handle and drill a hole of suitable size down the center from the top. Insert the rod and weld or solder the joint. If you wish to use interchangeable lengths of rod, tap the hole and thread the rods for screwing into the wrench. Should the chuck prove too loose for holding small drills, file the slots slightly wider.—NORMAN F. WILLARD.

Tool for Cleaning Out Cracks in Plaster

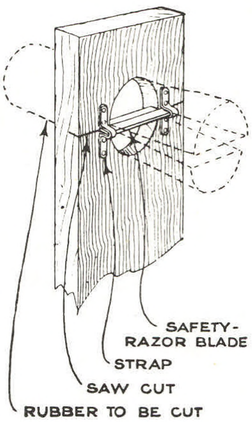
BEFORE patching long, narrow cracks in plaster walls such as those that often occur in the corners of a room or along the baseboard, it is necessary to widen them, clean them out thoroughly, and undercut the edges a little. This can be done quickly and easily with a crack-opening tool made as shown below from an ordinary beer-can opener. The handle is shaped from a soft pine block about 3/4" by 1 1/2" by 3 1/2" and riveted or bolted in place. Sharpen the point on a bench grinder whenever it becomes dull and does not cut well.—P. R.



A wooden handle is bolted to a beer-can opener

Fixture for Splitting Round Rubber

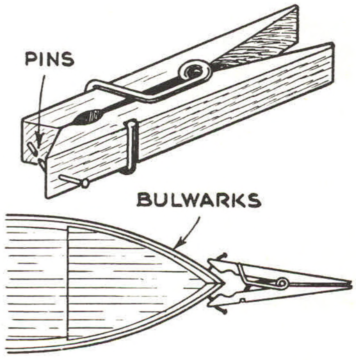
Almost everyone knows the difficulty of attaching round rubber to a flat surface so as to make a neat job, and splitting the rubber so that the cut surface will be even is also difficult. The simple fixture illustrated herewith shows how the latter can be done quickly and neatly. A hole to accommodate the rubber is drilled in a board, and an old razor blade is fastened securely into a groove provided for it on one side.



The operation is started by slitting the rubber for a few inches with a knife and then inserting it in the fixture and pulling it through from the back.—Frank Jablecnik, Chicago, Ill.

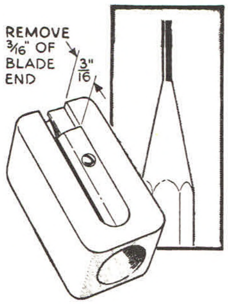
Spring Clothespin Aids in Gluing Ship-Model Bulwarks

BULWARKS at the stem of a ship model can be clamped together with an ordinary spring-type wooden clothespin while glue is setting. Pins are inserted through the jaws, as illustrated in the drawing at the right, in order to hold the bulwarks against the curved surface of the bow.—WILLIAM S. LEIBBRANDT.



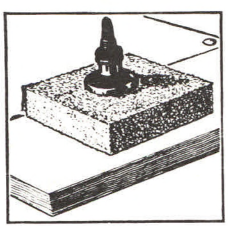
Homemade Hand Soap Removes Grime

GREASY, grimy hands are no novelty these days. The problem of keeping them clean can be easily and inexpensively solved by making a soap solvent at home. Simply dissolve 1 lb. of soap chips in 1 gal. of boiling water. Remove this mixture from the fire, add 1/2 lb. of soda ash, 1 lb. of pumice stone powder, and 1/4 oz. of oil of citronella. This solvent is harmless to the hands, and does an efficient job.—P. A. B.



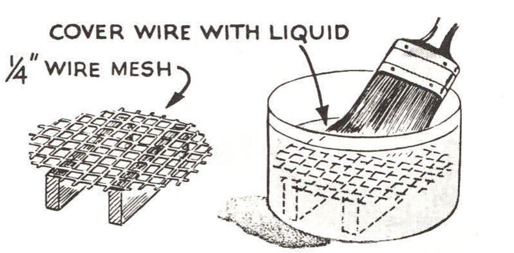
How to Adapt Sharpener for Drafting Use

To ADAPT an ordinary hand pencil sharpener for sharpening drafting pencils, remove about 3/16" from the end of the blade. The sharpener then will shave only wood from the pencil, and the lead may be shaped with a file or sandpaper. The length of the exposed lead can be made as long as desired by the draftsman.—EUGENE MERKIN.



Sponge Rubber Forms Nonskid Bottle Holder

BY SETTING an ink bottle into a piece of sponge rubber, it can be kept from sliding off a tilted drawing board, and the sponge also serves as an excellent penwiper. Cut a hole in the rubber and push the bottle not quite all the way through.—NORMAN DALY.



Paintbrushes can be cleaned by placing a circle of wire mesh on two blocks in a can of cleaner and rubbing the brushes briskly across the mesh

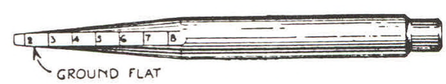
Tap and Drill-Hole Gage Made from Discarded Nailset

THIS little gage can be made from a nailset that has been discarded because of a worn point, although it is valuable enough to sacrifice a new nailset in order to make it.

Every mechanic is well acquainted with the difficulty of ascertaining the drill size of an existing plain or tapped hole, particularly if it is too small to be calipered. In most instances it is necessary to try several drills before its size is determined, and that often entails putting each drill through a gage to find out what size it is.

This gage is instant, accurate, convenient to handle and carry, and costs only a little time. It is made by grinding and polishing a flat spot of even width along the tapered point and graduating it to correspond with the diameters represented at the various points. The divisions are found by inserting the point into a drill gage and marking the depth near the flat spot with a hard pencil.

When this has been done, the gage is ready to be etched. Heat beeswax until it becomes quite thin, and immerse the point



The figures are etched with acid

until it is warmed through. The graduations are scratched through the wax with a scratch-awl and the size is marked near each one. On the illustrated gage the numbers represent thirty-seconds. If the gage is intended especially for a tap gage, it can be marked to instantly show the size tap to use. For instance, a 1/4 by 20 United States standard tap requires a 13/64-in. hole; therefore mark the gage at the 13/64-in. diameter and designate the mark by the number 8, this meaning 8/32 or 1/4 in.

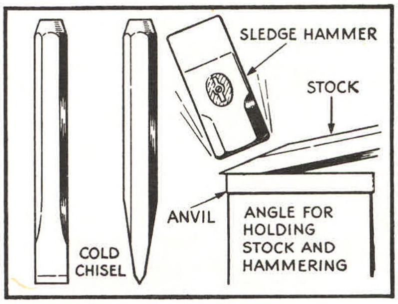
In scratching the graduations and numbers, do not strip the wax coating off other places. Scratching lightly will permit the etching fluid to do its work. This fluid is made of 1 part of nitric acid in 4 parts of water, only a few thimblefuls being required. The point is moved about in the acid for a minute or two.

As the graduations are below the general surface of the taper and never come in contact with metal, they do not wear and the gage therefore lasts a long time.

Intermediate sizes not shown can easily be computed, although it is also possible to divide each space between graduations by shorter marks.—HENRY SIMON.

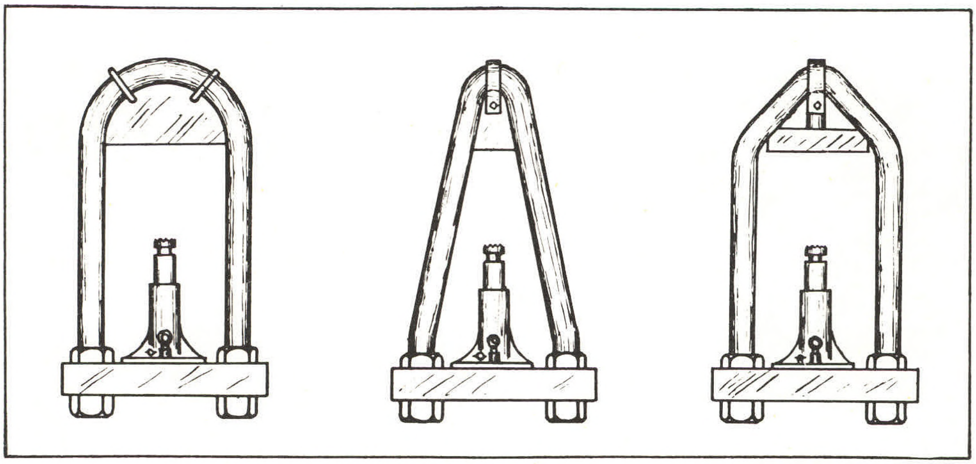
FORGING A COLD CHISEL

Tool steel suitable for cold chisels, cape chisels, punches, and drift pins may be bought from many hardware stores or from any blacksmith shop.



Hexagon or octagon tool steel is preferred, although old round or square files make excellent chisels. Tool steel should never be worked when above a bright-red heat, nor forged when the heat has dropped below a dull red.

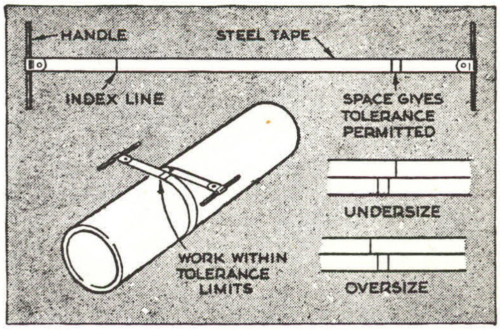
Forge the taper of a chisel evenly on both sides by holding the steel at an angle on the anvil as shown. Placing the steel close to the edge of the anvil permits the hammer to overhang the edge of the anvil, which results in a fine point on the chisel. As the point thins, the metal spreads; to remedy this, the chisel is placed on edge on the anvil and forged to size.



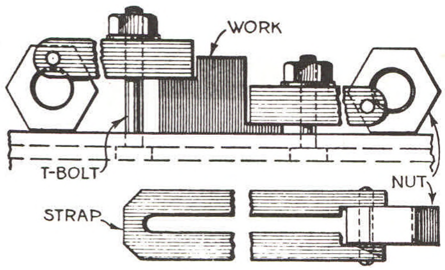
Suggestions for press frames

Tolerance Gauged with Tape

TOLERANCE of work produced at the Youngstown Sheet & Tube Company is checked with a novel type of gauge. An index line and two lines to represent the absolute maximum and minimum acceptable circumference are scribed on a strip of steel tape. In use, the tape is wrapped around the work. If the index line falls between the tolerance lines or flush with either, the work passes inspection. If it falls outside, the work is either over or under.—JOHN KRILL.



Variable Height Clamping Strap

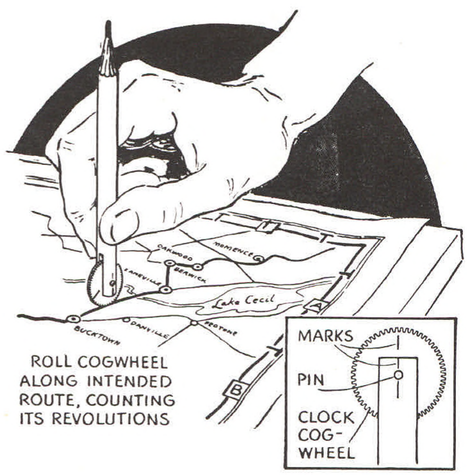


Another machine shop kink worth remembering is that a variable height clamping strap can be made of three parts—a hexagonal nut, a strap, and a hinge pin.

A long slot is provided in the strap to take the T-bolts used in the work table, and the end is yoked over the nut and fastened to it with the pin. Varying heights are obtained by indexing the nut and allowing it to rest on whichever one of its sides is the most suitable.

Fixtures made in this way avoid the necessity for hunting around for odds and ends of blocking to be used with the ordinary "jack" straps.

A MILEAGE ESTIMATOR for road maps can be made from a heavy drawing pencil, a cogwheel from an old clock, and a pin. Cut a slot in one end of the pencil, insert the cogwheel from which the shaft has been driven out, and insert the pin through a hole drilled through the pencil. Make a mark on the edge of the cog as shown. Now run the wheel over a planned route on the road map and count the wheel turns. Find out how many miles each turn represents on the map's scale, and multiply this by the wheel's turns.—F. G.

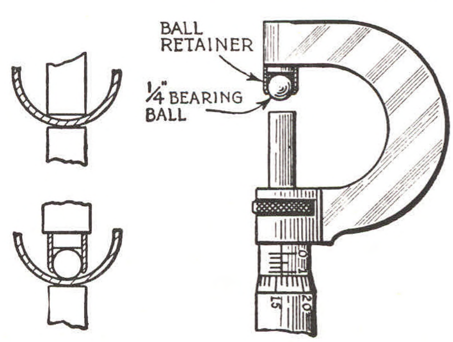


Micrometer Attachment

By C. M. Wilcox

The attachment consists of a short length of light gage brass tubing and a ¼-in. bearing ball. The tube or ball retainer is reamed out so that it will slide over the micrometer anvil. It is crimped as shown, to prevent the ball from dropping out. Bearing balls come pretty close to size, as a rule, but it might be well to gage a number of them and select the most accurate. When using this attachment, the reading is, of course, taken with the .250 graduation as zero.

With this attachment, an ordinary micrometer becomes a two-in-one tool; it serves for all ordinary purposes and, with the addition of the ball and ball container, measures accurately in awkward places where it otherwise would be more or less useless.

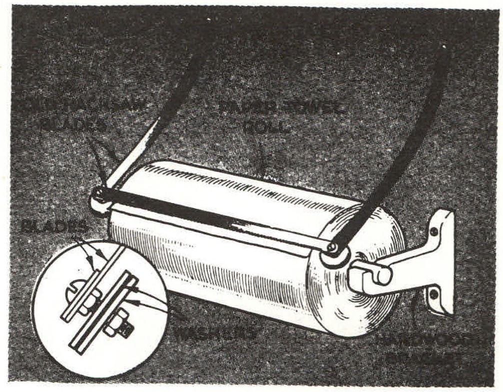


The ball-anvil micrometer is shown above

Towel Rack Has Handy Cutter

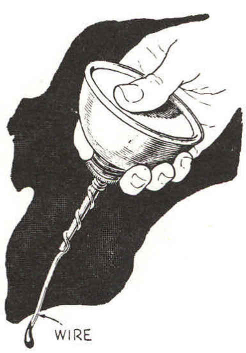
THREE old hacksaw blades and two brackets, arranged as at the right, make a handy paper-towel rack for the garage or workshop. Join the blade used as the cutter bar to the ends of the other two with small bolts and draw the nuts up tight. The addition of two free washers to each bolt and a second nut drawn up only part way will provide a pair of rollers to prevent friction on the towel roll.

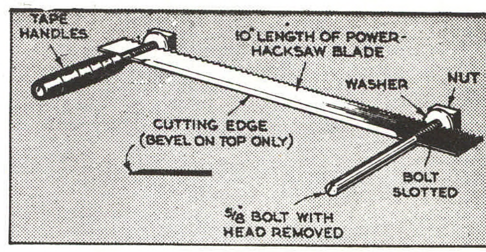
Saw two brackets from hardwood and screw them to the wall. Above them attach the free ends of the two blades holding the cutter.—HENRY L. DAVISSON.



Wire Extension on Spout Improves Oil Cans

FOR oiling out-of-the-way places in my car, I wrapped a length of soft copper wire around the spout of an oil can so that it extends several inches beyond the tip. In use, the end of the wire is placed on the point to be lubricated. The oil is forced from the can in the usual manner, but instead of dropping free from the end of the spout, it flows along the wire to the desired place, as depicted at the right.—H. S.





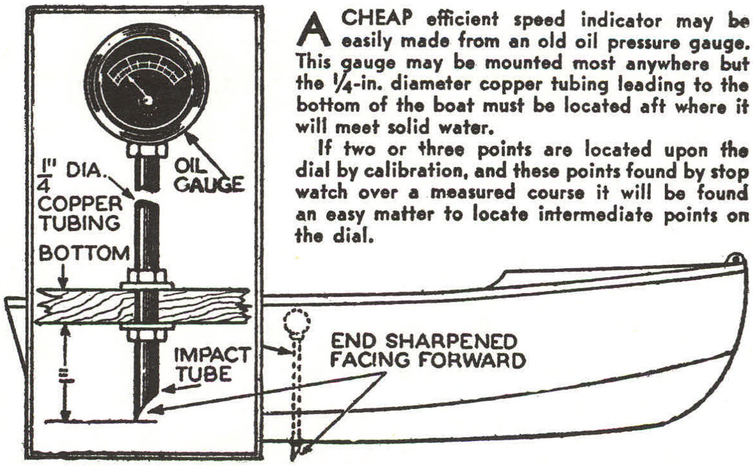
Saw Blade Used for Draw Knife

ONE of the handiest woodworking tools, the draw knife, is also one of the hardest to find in the smaller sizes. Two bolts and a broken power-hacksaw blade, however, can solve that problem. Remove the bolt heads and saw slots in the threaded ends. Grind a cutting edge on the back of the blade and secure the ends in the slots with washers and nuts.

Speed Indicator

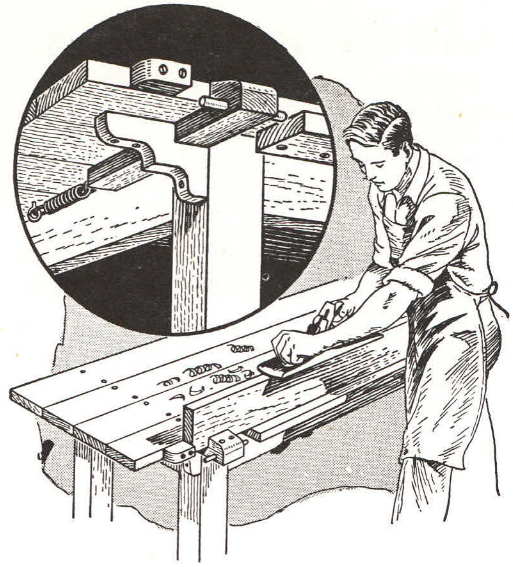
A CHEAP efficient speed indicator may be easily made from an old oil pressure gauge. This gauge may be mounted most anywhere but the ¼-in. diameter copper tubing leading to the bottom of the boat must be located aft where it will meet solid water.

If two or three points are located upon the dial by calibration, and these points found by stop watch over a measured course it will be found an easy matter to locate intermediate points on the dial.



Planing Vise Adjusts Itself to Any Wood

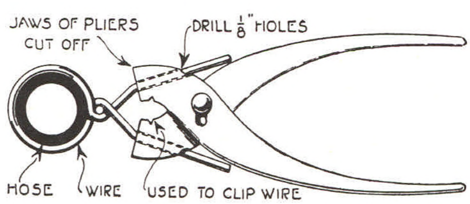
FOR planing the edges of different thicknesses of wood, ranging from very thin up to 2", I have for years used the quick-acting vise shown at the right. It can be made small for model work or larger for general work. One great advantage is that it does not obstruct the surface of the workbench as is the case with the V-type planing stop so often used. A powerful spring is required. The one on my vise was taken from an old iron bed.—ABBOTT B. DAVIS.



For Binding Hose Clamps with Wire

TO bind hose with tight wired connections a tool can readily be made from an old pair of pliers, even a pair with the ends broken.

Saw or grind the ends flush and drill with two ⅛-in. holes as shown in the



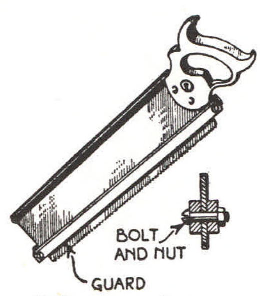
This useful tool may be made from an old pair of pliers

sketch. A U-shaped piece of wire is cut and the ends are placed through the holes after surrounding the hose. Twisting the handles makes a clamp that is both tight and inexpensive. Wire up to ⅛-in. in diameter can be used with this tool and wired patches about pipes, tanks, etc., can be made securely.—G. A. LUERS.

Provide This Simple Gage for Your Saw

A SIMPLE method of duplicating the depth of saw cuts in such work as making stair-treads, etc., is here described.

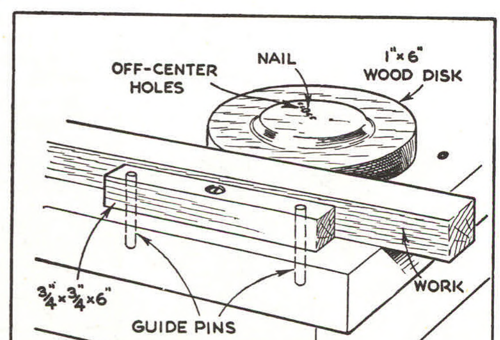
Get two narrow pieces of wood about 1 in. wide, ⅜ in. thick, and with the aid of two small carriage-bolts, fasten them to the saw as shown in the illustration. This forms both a gage and a guide, for it guarantees that you can only cut so deep, and it guides the saw at the finish to make a groove that is the same depth all the way.—J. H. MOORE.



This gage insures equal depth of grooves cut

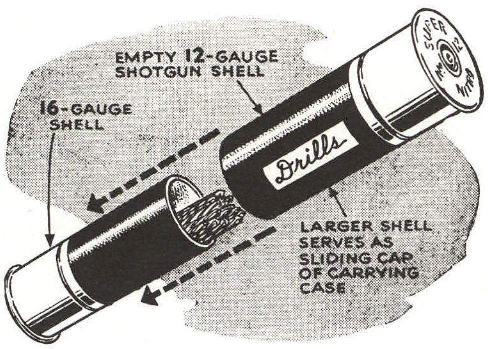
Eccentric Disk Holds Work of Any Size Securely on Bench

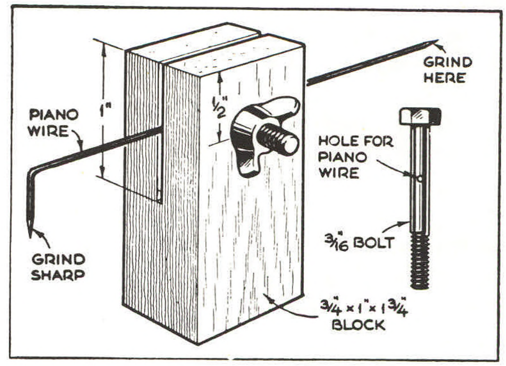
THIS eccentric vise holds work on a bench securely, yet opens at a touch. The diameter of the disk can be made to suit your work. Drill several holes through it on a radius, and several holes in the bench to allow for holding stock of various widths. The bench has a removable piece against which the work wedges when the disk is swung around toward it. A heavy nail through a hole in the disk and one in the bench serves as a pivot. The width of the work will determine which of the holes are best to use.



Shotgun Shells Form Drill Case

MACHINISTS and others who carry twist drills and small lathe tools in their pockets or tool boxes will find that a handy drill case may be made by sliding two empty shotgun shells together. They will form a sturdy case, and will help prevent the dulling or breaking of drills. Use one 16-gauge and one 12-gauge shell.—FRANCIS L. TYLER.



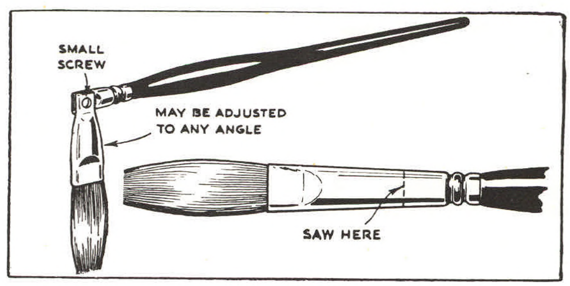


Scratch Gauge Made in Few Minutes

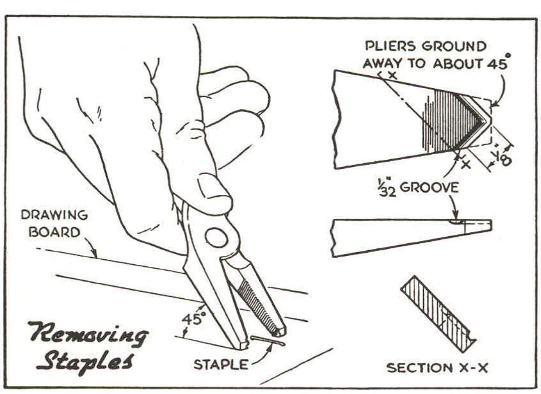
THIS scratch gauge and edge scriber was produced by drilling a 3/16" hole and cutting a slot in a hardwood block, and then inserting the bolt and marking it where it passes through the slot. A hole for the wire was drilled in the bolt at that point.—W. H. M.

Angle-Painting Problems Solved with Adjustable Brush

HERE'S an adjustable-angle brush for painting inaccessible corners on cameras, recording instruments, and similar equipment. Saw off an ordinary brush about two thirds of the way up the ferrule. Drill corresponding holes in the metal ends, and join the two parts with a machine screw and nut, as shown. Set at the most convenient angle, and tighten the nut.—CHARLES HOMEWOOD.



Quick-Acting Staple Remover Is Useful Tool for Draftsmen



FOR ease, convenience and speed, a stapling machine is superior to thumbtacks or tape in fastening drawings to a board, and many draftsmen would prefer to use it if the staples could afterward be removed quickly and without damage to the paper. It is not hard to convert a pair of thin-nosed pliers of good quality into an efficient and speedy staple remover by a simple grinding and filing operation.

The pliers should be of a small, handy size. Each jaw is carefully grooved with a file, as shown, and then ground to form two hooked edges which grip the staple.—R. L. W.

Simple Steam Box Enables Craftsmen to Bend Wood

SOME of the finest furniture a craftsman can build requires the use of bent members, but most home craftsmen have avoided construction of this type of piece because of improper equipment for successful steaming. If the proper steaming facilities were at hand, many items other than furniture could also be made. Such things as toboggans, skis, canoes and boats requiring the use of steam bent lumber would be within every craftsman's means.

A satisfactory steam box which is large enough to handle the average material worked in the shop can be constructed easily. The one shown in the drawing is ideally suited to the home workshop, and it is entirely self-contained; that is, the heating or steam generating unit is part of the setup, and it requires a space no more than 1½ ft. x 4 ft. It will take stock up to 7" wide and up to 48" long. Longer pieces that require only a short section to be steamed and bent, as in the construction of skis or toboggans, need to have only that portion which is to be bent placed in the steam box, while the remainder of the board projects beyond the box. The open end of the box can be closed by stuffing rags around the stock.

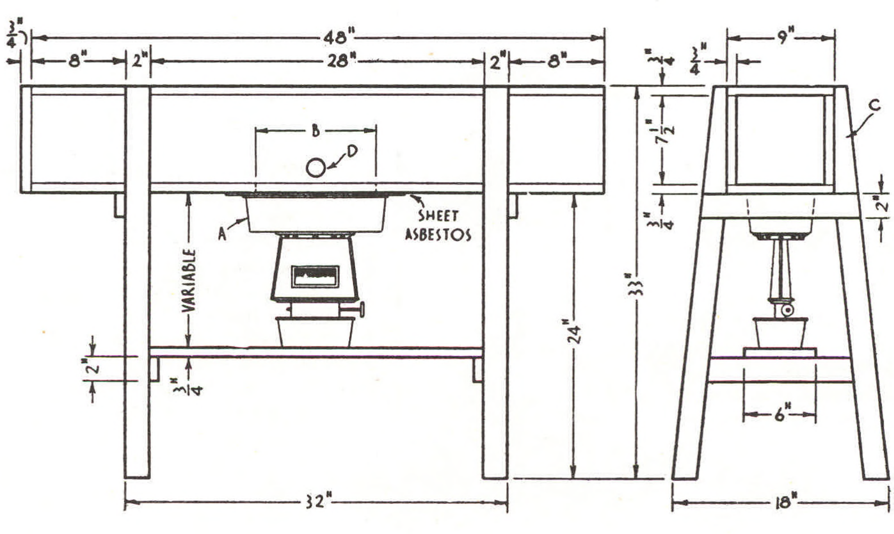
The builder needs ordinary stock, but it must be free of knots and checks. Top and bottom pieces measure ¾" x 9" x 48". If steam is to be taken from a water pan heated on an oil or gas burner as at (A) cut a hole 1" smaller each way than the top of the pan as at (B). Make two ¾" sides 7½" x 48" and one end 9" x 9"; assemble these parts and fasten with 7d common nails. Get out four legs 2" square and about 33" long, trim them as at (C). Cleats measure ¾" x 2". Cut two 14" long and two 17" long. Nail them as shown and saw the ends flush. Location of the bottom cleats depends upon the depth of the water pan and the height of the heater to be used; the latter may be supported upon the ¾" x 6" x 30" bottom shelf. Fasten the steam box in place with nails or screws.

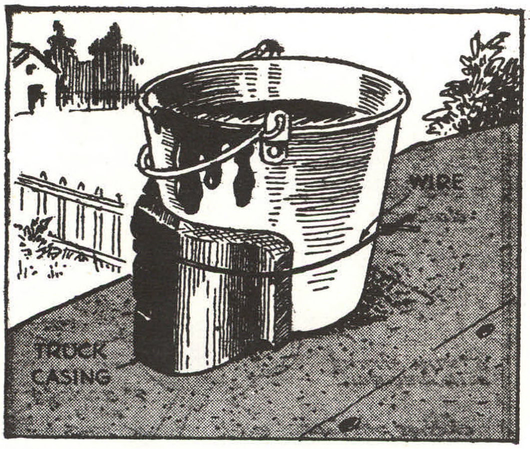
If steam is to be furnished through a pipe, bore a hole that fits loosely around the pipe as at (D). Allow the boards to be exposed to steam from half an hour to two hours or more, depending upon the thickness.

The actual bending of the steamed stock must be done in wooden forms previously prepared. Forms usually consist of two heavy blocks which have been bandsawed so that their inner faces are the same shape the steamed wood is to take.

Bending forms have square outside faces that offer good clamping surfaces. The steamed stock is taken from the chamber and placed between the forms. Clamps are applied to the forms and pressure is increased gradually until the stock and the forms are brought together at all points. The stock should remain in the forms until all excess moisture has left it.

Forced drying by heat is to be avoided. The surface fibers of the convex side of the stock are liable to break if the drying process is too rapid. Selection of stock for bending is important to success. Solid wood should be straight-grained and free from knots and other imperfections of surface. Hardwoods are more suitable for bending than softwoods. Hickory, oak, beech, birch and maple have the best physical properties for bending. Plywood can be steamed and bent only if it is waterproof.—*Charles A. King.*





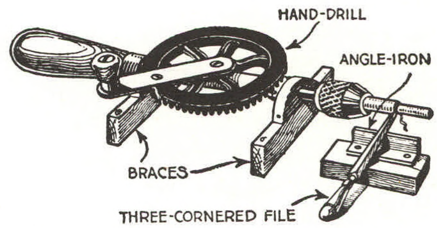
Tire Holds Pail On Roof

TO HOLD a tar pail upright and avoid possibility of it slipping on a sloping roof, one workman conceived the idea of cutting a section from a large auto-truck casing, one side angled to the same pitch as the roof, and attaching this to the pail with a hoop of stout wire. Ordinary automobile tires will work just as well.—*G. E. H.*

How to Turn Metal with a Hand-Drill

AMATEUR mechanics are often confronted with the necessity of turning a small piece of metal. This is a hard nut to crack for those who are not fortunate enough to have a lathe in their possession.

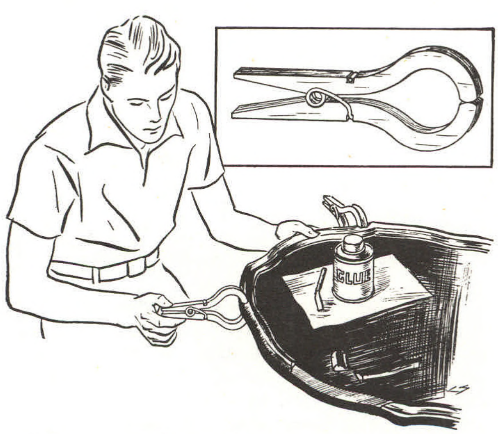
Small pieces of metal that are not beyond the capacity of the chuck on a small hand-



Arranged in this manner your hand-drill becomes a small, handpower-driven lathe

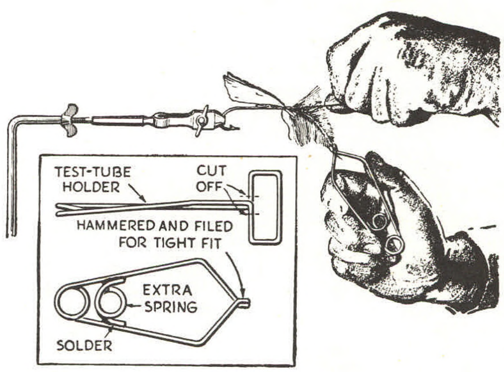
drill may be turned by mounting the drill between two clamps as shown. A little slide-rest is put together with a block and a piece of angle metal. A three-cornered file is ground off at the end and used to trim the metal.

The cutting edge of the file is held against the metal while the handle of the drill is turned.—L. LAURIER.



Clamps for Uneven Surfaces

SPRING wooden clothespins, which are often used as small clamps, can be considerably improved for certain types of work by discarding all but the springs and cutting new jaws from ½″ hardwood to the shape shown above. These jaws are much better for gripping uneven surfaces because there is no twist or side thrust to throw the freshly glued work out of line as when ordinary clothespins are used.—L. A. L.



Test-Tube Holder Converted into Fly-Tying Pliers

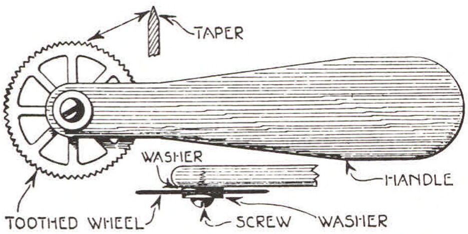
TO TIE flies expertly, it is necessary to have a good pair of hackle pliers. These can be made from a wire test-tube holder, obtainable from any chemical supply house for about ten cents. Cut off the holder where indicated; then hammer and file the ends to fit smoothly and tightly together. To increase the tension, an extra spring is then added as shown.—LEROY NOYES.

A Clock-Wheel Serves as a Paper-Perforator

A PAPER-PERFORATOR is easily made from an old clock-wheel.

Bevel the wheel on both sides until quite sharp. Now get a ¾-in. brass-headed screw, two small brass washers such as are used in clockwork mechanism, and a piece of wood to form the handle.

Place a washer on each side of the wheel, insert the screw, and attach to



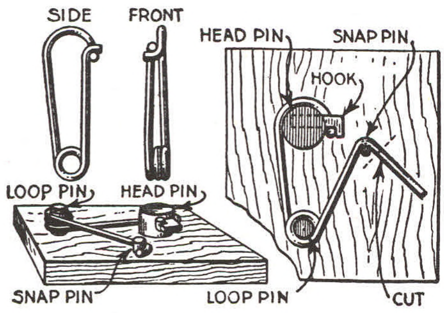
An old clock-wheel and a wooden handle make a good paper-perforator

the wooden handle so that the toothed wheel protrudes beyond the handle end.

This tool, drawn along a page, perforates the paper quite easily, and notebooks with fast leaves may be provided with detachable pages in a very short time.—George H. Holden.

Making Wire Snap Hooks

USEFUL for many varieties of strap and leather work, this type of snap hook can be made in quantities from ordinary round spring wire, about 3/32 in. thick. A



The hooks are made quickly by bending spring wire around a simple form

block is fitted up with plugs, as shown, to serve as a bending form.

A right-angle bend is first made in the end of the wire. It is slipped under a hook fastened in the larger plug and carried down and around the small plug three times, after which it is taken up and around the snap pin and given a sharp right angle twist. It is then cut off as indicated. The bends at the ends prevent the hook from pulling open under a heavy strain. These snap hooks will replace buckles.—J. V. P.

Painting floors is usually considered a disagreeable type of manual labor because of the backaches that almost invariably result when one attempts to do the painting while standing up, or the sore knees caused when one does it while kneeling. The writer has tried both methods and does not like either. Recently, while painting the porch floor, he asked himself, "Why not sit down?"

A simple stool was made, as illustrated, out of a 1-in. board, about 8 in. square, a

The one legged stool

2 by 4, 1 ft. long, and some cloth. The cloth was wrapped around the lower end of the 2 by 4 to protect the floor from scratches.

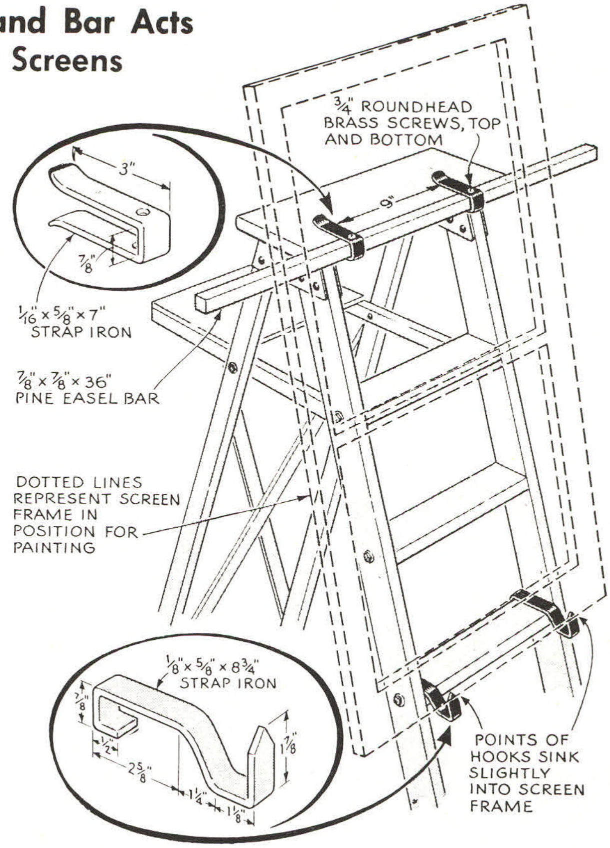
A one-legged is preferable to a three-legged stool, because it permits considerable movement and enables one to cover a large area of floor before making a move. The weight mainly rests upon the stool and the legs are used only for maintaining the balance and shifting around from place to place.—N. G. Near.

Emergency Developing Trays

DEVELOPING trays for either photographic or blueprint work can be made in an emergency from shallow wooden or even cardboard boxes. One method is to coat the box inside and out with hot paraffin wax; the other is to use black asphaltum varnish. The asphaltum makes a good looking as well as serviceable tray.

A cigar box can be used for a small tray by driving a few extra brads into it, giving it a thin coat of asphaltum and alcohol or asphaltum and turpentine and then pouring the thick asphaltum in and running it around until the interior has been thoroughly soaked.—Cora Hamilton.

Stepladder with Hooks and Bar Acts as Easel for Painting Screens

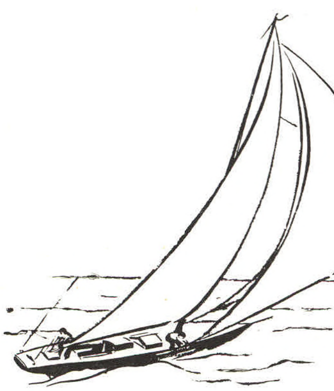


BY MAKING the simple attachments shown, you can convert a common stepladder into a satisfactory easel for painting or washing screens and storm sash. The strap-iron parts can be formed with vise and hammer, or any blacksmith or small machine shop will make them at reasonable cost.

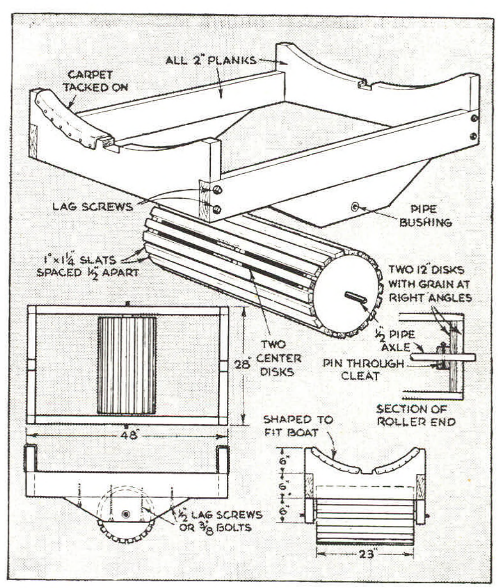
The two pieces shown in the lower detail hook over a step and hold the bottom of the screens or storm sash. They allow the bottom edge to be painted. Note that the points are ground off somewhat abruptly in order to avoid unnecessary penetration of the wood.

The long wooden bar is held across the ladder farther up for the screen or sash to rest against. This crossbar may be padded with cloth, if desired.

The only precaution to observe is to avoid using the easel outdoors on a windy day, when the screens might be blown off the easel.—M. W. MUTSCHLER.



Dolly Helps in Transporting Boats from Beach to Water

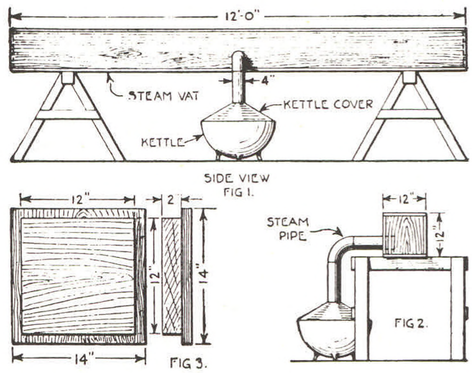


A DOLLY built as shown in the drawing at the right is an invaluable aid in transporting small craft down the beach and into the water. The wide roller that carries the load is especially designed not to sink into the sand as ordinary wheels would.

Any 2" thick scrap lumber will do for the frame, the two ends of which are shaped to conform to the bottom of the boat. Notches receive the keel. The four surfaces on which the boat rests are padded with carpeting or burlap to prevent damage to the hull.

The roller is built of 1" by 1 1/4" slats nailed about 1/2" apart to ends built up of two 12" disks each. Place these so that the grain of one is at right angles to that of the other. A piece of 1/2" pipe pinned to the ends turns in pipe bushings set into wooden bearing supports. These latter are bolted to the frame after the axle has been inserted in the bearings.—H. S.

Constructing a Steaming-Vat at Home



Amateur boat-builders will find it advantageous to build a steaming-vat for bending rib timber

IN building motor-boats and canoes, it is necessary to bend the ribs and planking to shape, and very often considerable trouble is experienced in doing this. Soaking the material in water will answer where it is not to be bent to any extent, but in bending ribs for canoes and model hulls, it is necessary to steam them so as to bend them properly.

In the accompanying illustration is shown a steaming vat that can be easily constructed. The vat is so simple, that at a single glance one may readily understand its construction.

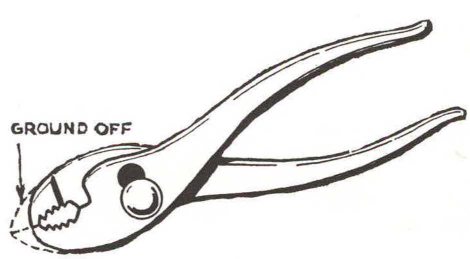
First procure a couple of trestles such as are used by carpenters. They are usually from 2 to 3 ft. in height. Next make a box 12 in. by 12 in. by 10 ft.

If ribs are to be steamed, the box may be made longer to suit the work. The box should be left open at one end to receive a plug. A hole 4 in. in diameter is then bored in one side of the box, to receive the pipe from the kettle.

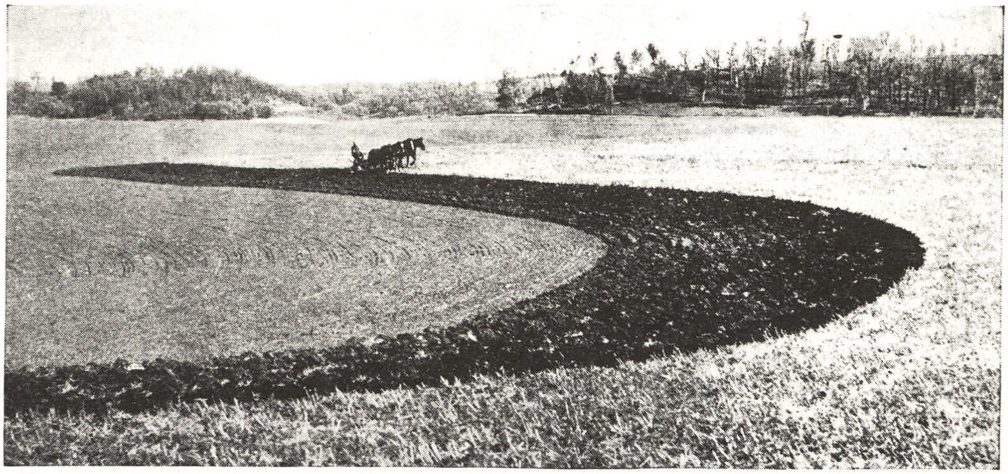
The next step is to make the funnel cover for the kettle. This funnel may be made of galvanized iron. No dimensions are given, as the size depends upon the size of the kettle. However, the pipe conveying the steam to the box should be about 4 in. in diameter, so as to allow free passage to the steam. The kettle should be placed about 4 ft. to one side of the box. A discarded gutter-pipe and elbow will answer the purpose.

A few strips of wood, about 3 in. thick, should be nailed to the bottom of the box to prevent the material from resting on the bottom and thus preventing the circulation of steam. The kettle should be nearly full of water, and the material placed into the vat before the fire is started. Do not steam too many pieces at one time, also see that the plug is tightly fitted.

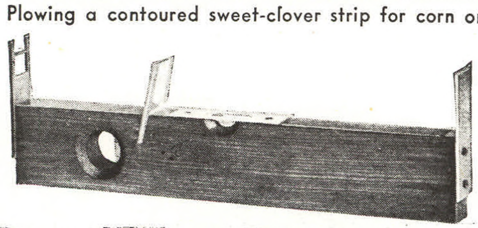
The time required for steaming can only be determined by occasionally testing the pieces until they are found to bend easily. You will find that material that has been steamed in this vat can be bent to almost any shape.—O. B. LAURENT.



THIS BATTERY TOOL for loosening terminals can be made by grinding down the nose of a pair of common pliers. The standard nose is too long, interfering with a good grip, while the shorter nose allows closer work and will not mar the battery.—C. L. L.



Plowing a contoured sweet-clover strip for corn on the Adolph Solum farm near Spring Grove, Minn.



HOMEMADE LEVEL LOCATES LINES FOR *Contour Plowing*

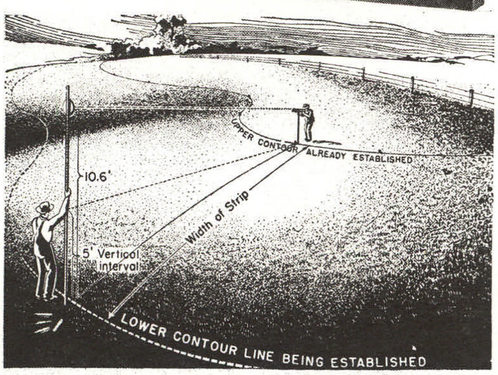
By WALTER W. JOHN

U. S. Soil Conservation Service, Milwaukee, Wis.

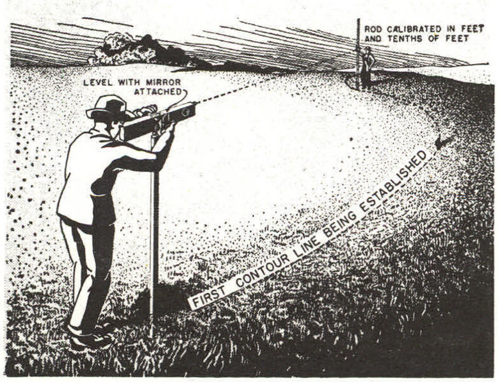
CONTOUR plowing is a tried, effective method of conserving topsoil and water on hilly ground. Each level furrow, running at right angles to the slope of the ground, helps halt the downward flow that results in erosion. This method of plowing also saves from 5 to 20 percent in tractor fuel.

Technical experts use expensive instruments for laying out contour lines, but Ray Cox, of Red Wing, Minn., has adapted a low-priced carpenter's level for the purpose. A metal plate is screwed to each end as shown in an accompanying photograph. One plate has a peephole, the other a wire sight soldered across a cut-out section at the same height as the peephole. A mirror is glued into a slot to reflect the spirit bubble to the user as he takes a sight.

The level is mounted on a leg or tripod at a fixed height. A helper carries a rod calibrated in feet and tenths of feet or inches and having a movable target. The rodman moves this from point to point along the line, going uphill or downhill until the surveyor sights the target at the same height as that of his level, with the spirit bubble between its centering lines. Stakes are used to mark out the contour line thus established. Other lines are marked in the same way, or else from the first one by setting the target at a suitable height.



Marks on the rod show how far off level the rodman stands. Below, in laying out a lower line from the first, set the target higher



A Tool to Bind Couplings of Hose-Pipes

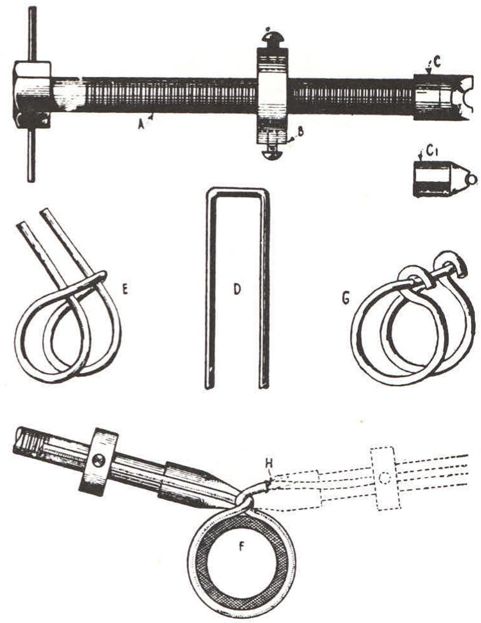
THE accompanying illustration shows a tool for binding couplings of hose-pipes which I made for my own use and which any one who has need for such a tool may duplicate by following the directions given. *A* is a hexagonal-head screw, 4 in. long and ½ in. in diameter, with the threads filed off at the end.

This should fit the socket *C*, which is made of a piece of ⅛-in. gas-pipe, the end of which is filed to a point as shown and is grooved to fit the binding wire.

A small piece of iron is *B*, drilled and tapped to fit the screw *A*. On each side of this nut are drilled small holes for the binder wires and on the ends are holes drilled and tapped for the set screws to hold the binder wires while the tool is in operation.

To use the tool, take a piece of hay-baling wire and bend it as shown in *D*, wide enough to fit over *C*, and the ends of the binder. The ends of *D* must be long enough to pass around the hose and into *B*, which will then be formed as shown in *E*.

Now place the wire form over the hose, putting the coupling in place and attach the tool as shown in *F*. The closed end of the staple shown in *D* should rest in the groove of part *C*.

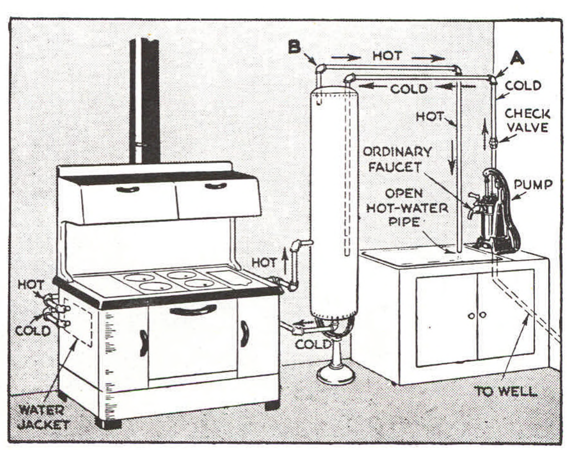


Soon your garden hose will need mending and recoupling. Provide yourself with the right tool

The two ends of the staple should be fastened in the holes drilled through the nut *B*. *B* should be brought down close to *C* and the set screws tightened in the two wires. Then the screw *A* should be turned until the binder is taut, then turned over so as to loop the ends over the straight part of *D*.

Take off the tool, cut the wires at *H* and hammer them down to a clinch. After a little practice you will have no difficulty in making your couplings tight.—CHARLES F. TAYLOR.

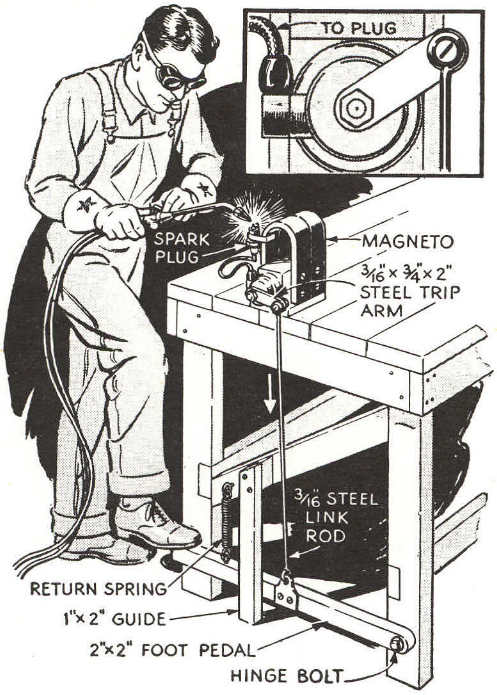
A HOT-WATER SYSTEM for farm kitchens without running water can be made of standard parts as shown at the right.



The force pump should be the type having an extra discharge outlet in addition to the spout. When the faucet on the spout is turned on, cold water can be pumped directly from the cistern. When this faucet is turned off, however, and the pump is worked, water goes up through pipe *A* and into the bottom portion of the hot-water tank. In so doing, it displaces hot water from the top of the tank. This water is forced through pipe *B* until it comes out directly over the sink. A hot-water jacket in the kitchen range is connected to the boiler in the usual way.

It must be remembered that no hot water is obtained unless the faucet is closed and the pump worked. The range boiler is in no danger of running dry if the pump is not used, for no hot water leaves it unless the pump is worked. The only other outlet from which water can be drawn is the drain at the bottom of the tank, which is used only when it is necessary to clean it out.—JOSEPH W. REIS.

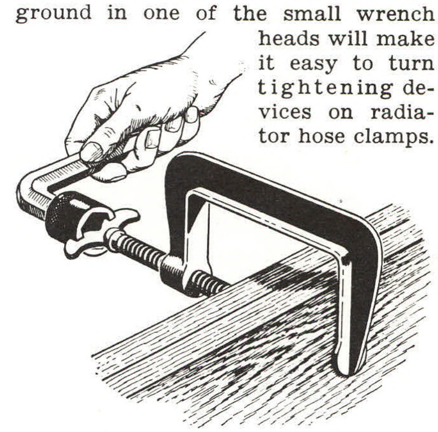
Engine Magneto Mounted on Bench Lights Gas Welding Torch



AN OLD magneto mounted either as shown or under the workbench can be used for lighting a gas torch. In this instance a magneto from a single-cylinder motorcycle was used. The trip arm must be set so that the magneto points break at about the halfway point on the down stroke, causing a spark at the spark-plug electrodes. Adjust the linkage for normal operation, and provide a pedal-return stop.—WALT LOVELL.

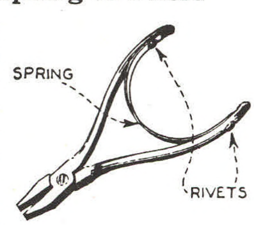
Slot in Socket Wrench Used for Tightening Wing Nuts

IF A SLOT about ⅛" wide and ⅛" deep is ground across the end of one of the larger heads of a socket-wrench set, it forms a tool that will tighten or loosen wing nuts or thumb screws. The most stubborn wing nut may be turned with its aid. A narrower slot ground in one of the small wrench heads will make it easy to turn tightening devices on radiator hose clamps.



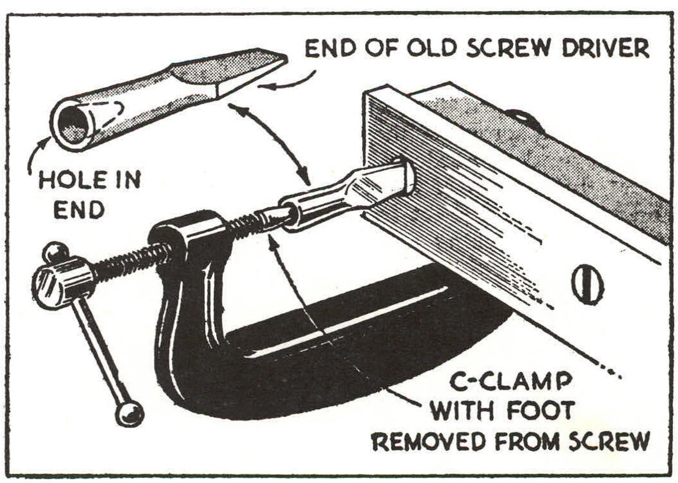
Adding a Spring to Pliers

A PIECE of flat spring steel riveted to pliers handles as shown is a convenience for certain kinds of work. The tension of the spring keeps the jaws of the pliers normally open and therefore allows a ready use of the tool.—JACK PRINTZ.



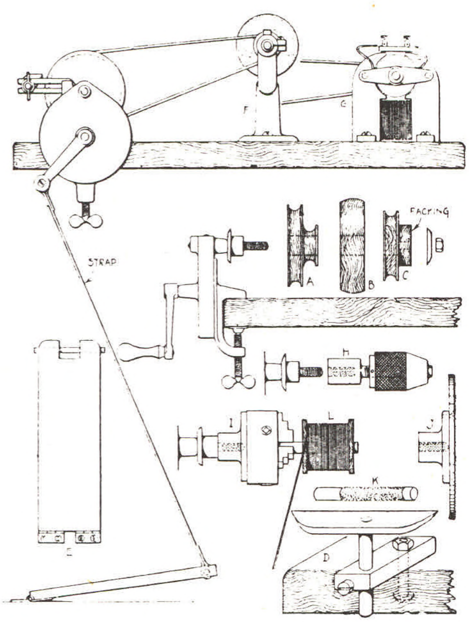
Handy Device For Auto Mechanics

THE gadget illustrated at right will loosen the tightest of machine screws that have rusted fast. First, an old C-clamp is altered as shown. Next, a heavy duty screw driver is cut off short and the end drilled out. To use, the clamp is placed on the work, with the screw driver bit held tightly in the screw slot by turning the clamp down upon it. After soaking screw with kerosene, bit is turned sharply with pliers, and the clamp slowly backed off as screw comes out.—*A. H. W.*



The Utility of the Hand-Power Grinder

BESIDES running a regular grinding wheel for sharpening tools, a small hand-power bench grinder may be adapted to a large variety of other uses in the home or small shop, especially when no lathe is at hand. By removing the grinding wheel, different



The small hand-power bench grinder may be adapted to a variety of other uses, such as attaching to a small dynamo or a light machine

sizes of pulleys may be clamped on the spindle in its place. In the illustration, at *A*, *B*, and *C* are shown a grooved two-step wooden pulley, a crowned face pulley for a flat leather belt, and a single grooved pulley with a wood packing disk.

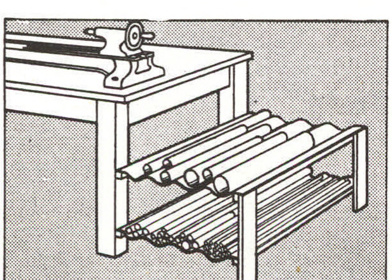
Such pulleys can be turned to shape by first cutting a hardwood block to a roughly octagonal form, boring to fit the grinder boss, clamping to the spindle, and then rigging up a work-rest something like that shown at *D*, which is clamped or bolted to the bench alongside of the grinder and is used the same as the work-rest of a lathe.

To make the device still further resemble a foot-lathe, a light wooden treadle, *E*, can be rigged up as shown. It is hinged to the floor and connected to the crank handle by a leather strap. Only a light foot pressure should be applied, however, or the handle will be bent or broken.

A pulley fitted in place of the grinding wheel will serve to drive light machinery requiring only an intermittent application of power. Sometimes it is desired to drive a light-power grinding stand, as at *F*, in order to obtain an increased speed or to obtain the benefit of special buffing or other equipment furnished by the power grinder. Another application is the driving of a small dynamo, as at *G*.

At *H* is a coupling turned up from a piece of cold-rolled steel, tapped at one end to fit the grinder spindle, and turned down and threaded at the other to take a chuck from a hand or breast drill. A small flange is shown at *I* and *J*, also drilled and tapped to screw on the spindle. A 2- or 3-in. universal chuck is fitted to the flange, and either this or the drill-chuck will hold drills or small pieces for polishing or filing.

A wooden or metal rod with a piece of abrasive cloth glued around it, *K*, is a useful device when held in the chuck. Another important use is to hold a magnet core or spool for the coil winding, *L*. *J* shows a disk grinder—a brass or iron or even a hardwood disk screwed to the flange and a disk of abrasive cloth glued to its face. This will prove to be a very useful piece of equipment. A second disk could also be constructed and sandpaper glued to it for finishing small patterns and other woodwork.—H. H. PARKER.

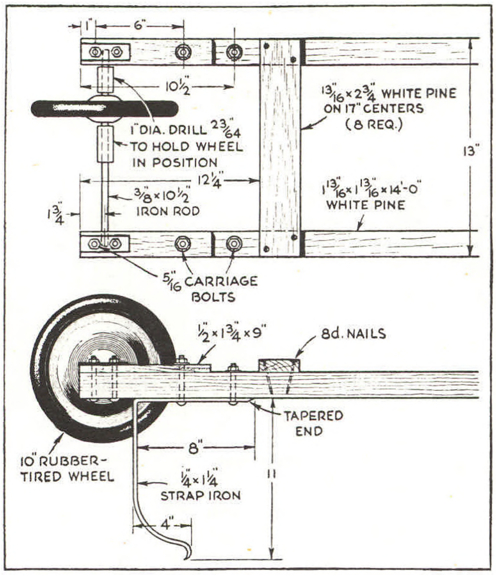


Corrugated Iron Holds Round Stock

SMALL lengths of round stock can create a hazard around the shop if they are just left to kick around or even if they are placed on the flat-racks you use for other materials. By securing a sheet of corrugated iron across the posts of a material rack, however, you can keep them around safely and within easy reach. A smaller piece of the iron should also be set up near the machines on which you most frequently use the stock.—JO RO JUNG.

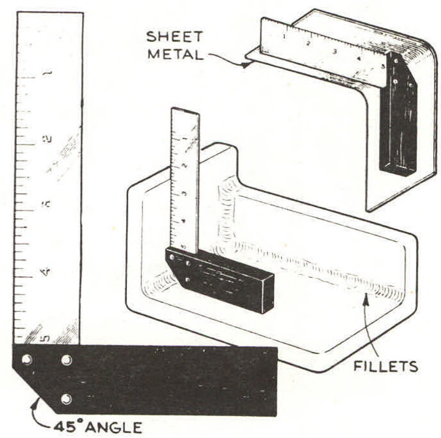
Wheel Mounted on Ladder Aids in Hooking It over Ridge

ONE MAN can hook this wheeled ladder over the ridge of a roof. The wheel and its axle can be taken from a child's discarded tricycle and attached to the ladder as shown. Set a ground ladder to reach above the roof and ascend this, carrying the other. Place the end of the wheeled ladder on the roof and roll it up the pitch until the wheel goes over the ridge. Then flop the ladder over so that the hooks catch.—A. D. S.



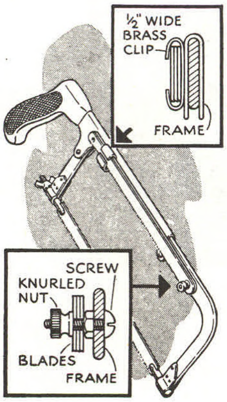
BY SAWING A 45-DEG. BEVEL at the 90-deg. corner of an ordinary try square having a metal, wooden, or composition handle, you can make a "fillet square" that will be useful in welding, sheet-metal work, pattern making, and many other jobs. For welding, where the square may be near intense heat, use a heat-resistant handle that will not be damaged.

If preferred, you can make your own "fillet square," slotting and sawing the handle to shape, and riveting it to a steel rule. Have the zero mark at the far end of the blade and align the inside of the handle with an inch mark.—ALBERT H. DOERR.



Extra Blades Held in Reserve on Frame of Hack Saw

HACK-SAW blades of several different sizes to suit a variety of work, as well as extra blades for use in case of breakage, may be kept handy by carrying them on the frame of the saw itself. A C-shaped clip of ½" wide brass is soldered on the frame near the handle, as shown, to hold one end of the spare blades. The other end is fastened by means of a small bolt, for which a hole has to be drilled in the frame. The end holes in the blades are slipped over the bolt, and a knurled nut, such as one from a discarded dry cell, secures the blades.—B. K.

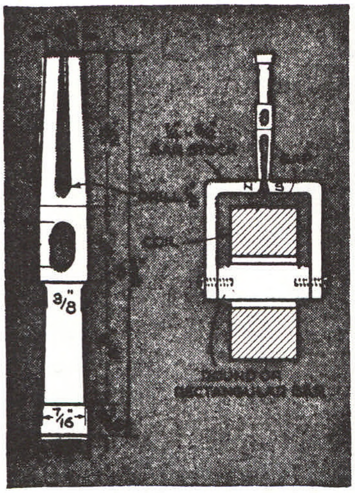


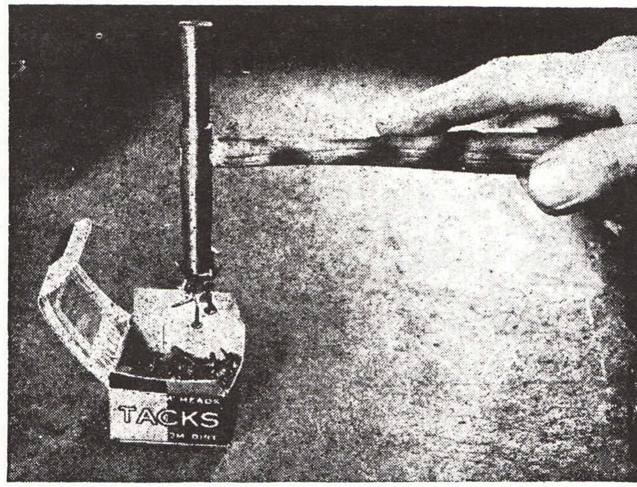
Lump of Putty Kept Handy on Bent Piece of Wire

TO KEEP a small lump of putty handy for filling nail holes when painting, one painter bends a length of wire as shown. The putty is pressed around the wire, which is then hooked over the edge of the pail.—G. H.

No Bruised Thumbs with This

MAGNETIC TACK HAMMER





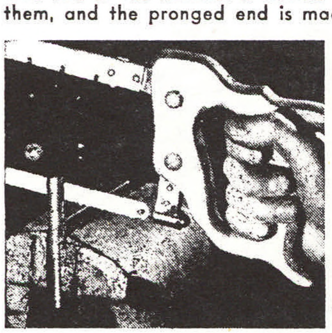
WHEN one end is a horseshoe magnet, a light hammer will pick up and place a tack or small nail without requiring it to be held, thus saving many a sore finger. Drill rod was used for the hammer shown. The striking end is first turned to the shape shown above; then the magnet end can be slotted with a hacksaw. Enlarge the slot to 1/8" with a thicker hacksaw blade, two or three blades side by side, or a slotting blade. Finish the slot end with a round file. Or, if you prefer, drill a 1/8" hole first and saw to it. Press the prongs almost together in a vise and turn the taper.

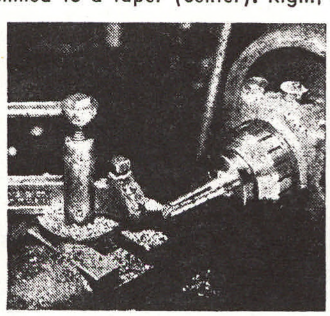
Drill and file a handle eye. Then bind the prongs with iron wire to prevent spreading, and harden and temper one end at a time.

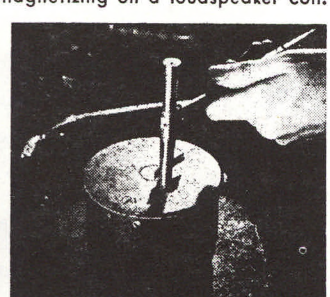
The hammer must be magnetized so the split ends present opposite poles and there is no magnetism in the other end. An open-solenoid magnetizer may be used if fitted with two bent pieces of bar iron bolted to the end of an iron core, as in the drawing. Touch a prong to each pole and turn the current on for an instant.

Or you may use an old 6-volt loudspeaker field coil of the type that has a narrow, annular voice-coil slot. Bridge the slot with the prongs, spreading them slightly with a nonmagnetic metal if necessary for better bridging and maximum effect. The coil may be connected directly to the 115-volt A.C. line if the current is turned on only momentarily, or to a battery or rectifier. In the first case maximum magnetic strength will depend on the point in the A.C. cycle at which the circuit is broken, so several attempts may be required.—ERVIN WALTERS.

One end of the hammer is slotted (left), the prongs are bent together so paper will just pass between them, and the pronged end is machined to a taper (center). Right, magnetizing on a loudspeaker coil.

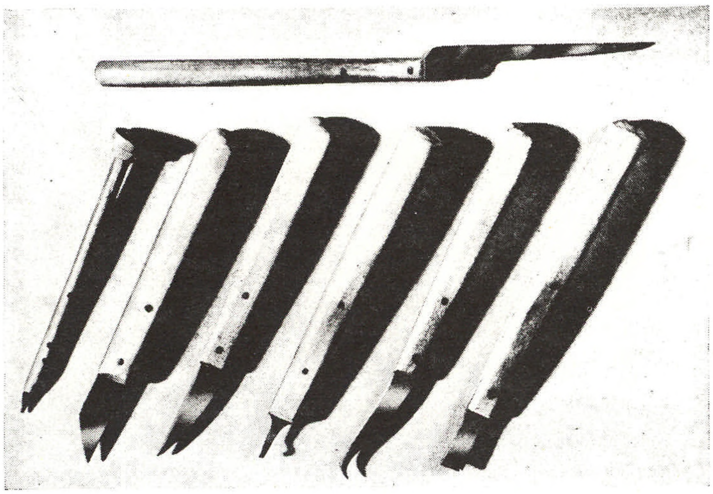




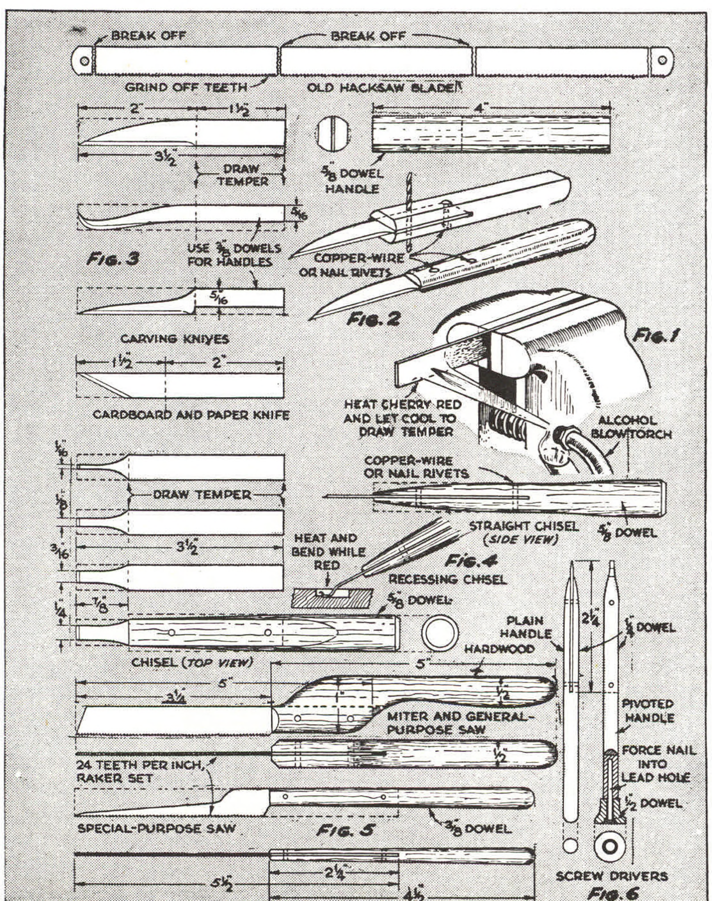


NEW TOOLS FROM OLD HACKSAW BLADES

By C. W. Bertsch



These unique tools, which are of special value to the model builder, can be made from sections of hacksaw blades. The high-quality steel holds a keen edge and will stand up well even under rigorous service



RAZOR-edged knives, chisels, and other tools may easily be made from worn or broken hacksaw blades. Designed to reach hard-to-get-at spots, these tools are particularly suited to model making or other fine work. Blades, nails or copper wire (No. 10 gauge or smaller), and short lengths of dowels are the only materials needed. A 12" blade is sufficient for three tools.

An all-hard blade, .025" thick, is best. Break off the required length in a vise and anneal the part to be inserted in the handle, so that it can be drilled. A small alcohol torch generates enough heat for this purpose. Place the part in a vise, heat to a dull red, and let cool (Fig. 1). The vise will prevent the heat from reaching the tempered end. Grind the blade to shape, taking care not to draw the temper by "burning"; then grind the edge.

A dowel serves for the handle. Cut a slot for the blade and drill two holes just large enough for the wires or nails to fit tightly (Fig. 2). Use a small ball-peen hammer to form the rivets. Shape and smooth the handle on a sander or with a file, and put a keen edge on the blade with an oilstone. This knife will hold its edge through hard service.

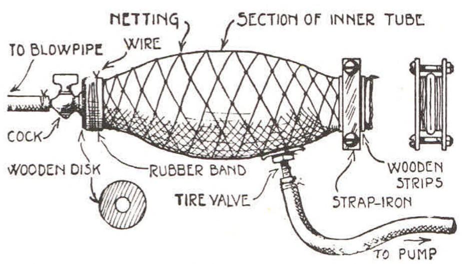
Illustrated in Fig. 3 are other blade shapes. Excellent chisels for delicate work can also be made in the same manner. To retemper the recessing chisel (Fig. 4), heat it to a cherry red and plunge it into water.

The saws in Fig. 5 should, of course, be made from a new blade. Small screwdrivers, with either plain or jeweler's pivoted handles (Fig. 6), may also prove to be useful additions to your kit of special tools.

A Pressure Apparatus for the Gas Blowpipe

A GAS blowpipe requires air under slight pressure, and a simple and inexpensive way to obtain this pressure, and to maintain it steadily, is shown in the accompanying sketch.

Arrange a foot-pump—an ordinary tire-pump—to deliver air to a bag made of a section of an old inner tube; about 2 ft. of the tube will be enough. Close up one end tightly, cementing the rubber and holding the edges firmly together with two strips of



The old automobile inner tube acting as an air container for a gas blowpipe

wood clamped with screws, as shown. Connect the air hose from the pump to the tire-valve.

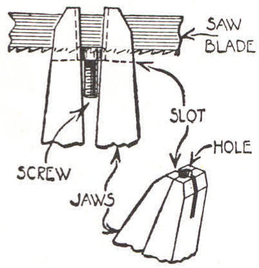
For the other end of the air bag, cut a disk of wood large enough so that the tube will have to be stretched a little to go over it. Cut two rings from the tube, each as wide as the disk is thick. Give the edge of the disk two or three coats of rubber cement, and before the last coat is dry put one of the rubber rings on. Coat the outside of the ring with cement and place the tube over it. Finally, slip the other ring over the outside of the tube and bind it in place with insulated copper wire, such as ordinary bell wire.

Put an air-regulating valve in the disk, in which a hole has been drilled of the right size for the valve to screw into tightly; an ordinary gas-burner cock is as good as anything. Run a rubber pipe from this to the blowpipe. It makes a much better job if the bag is enclosed in netting, or even in a cotton envelope, which will allow it to expand to about twice its normal diameter, but will prevent its bursting. If the tube is old and rather deteriorated, do not allow it to expand to more than one and a half times its original diameter.

A foot-power arrangement may be applied if desired; and it is a great convenience, leaving both hands free all the time.—R. PRINDLE.

Adapting the Pliers for Slotting Screw-Heads

MECHANICS who work upon small machines or other mechanical appliances, such as clocks, phonographs or electrical apparatus, will find this idea of value. Where many screw-heads are to be slotted, some suitable means of holding them is necessary. To this end a pair of snub-nosed, parallel-jawed pliers can be quickly adapted.



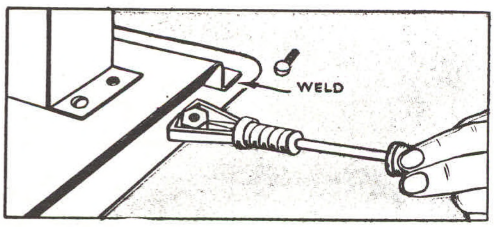
Plier jaws sawed in this manner are doubly useful

Close the jaws and drill a small hole down between them in the center to a depth of almost ¼ in. Then saw a slot at right angles to the jaws, and to the same depth as the hole, and across the center of the hole.

Harden the jaws so they will withstand future sawing in the slot.

To use: Place the screw-head in the hole at the bottom. Close the jaws about it and hold the pliers against the bench.

Then run the saw down the slot and cut the slot in the screw-head as deep as desired.—WINDSOR LOWELL.

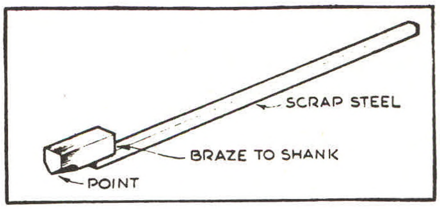


Screwdriver Gets into Corners

WORKING in tight spots on radios, cars, and similar compact assemblies, I have found that a screw-holding screwdriver, used as shown above, is often helpful for holding nuts in places that fingers can't reach. Adjust the spring-metal gripper to hold the nut firmly between the jaws and the screwdriver point.—J. P. LEGER.

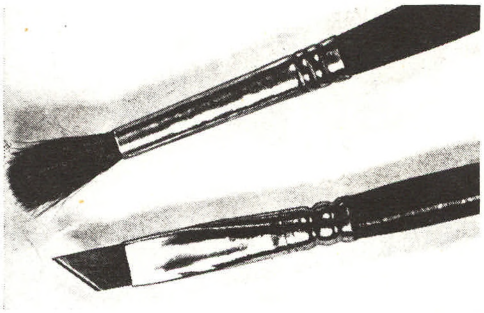
Glass Cutter of Tungsten Carbide

BRAZED to a short shank, a scrap from an old tungsten-carbide tool bit will make an excellent glass cutter. This tool alloy is exceptionally hard. Grind the point on a diamond or silicon carbide wheel to the shape shown and keep it sharp.—CARROLL MOON.



Bent Handle on Aquarium Net Helps in Removing Fish

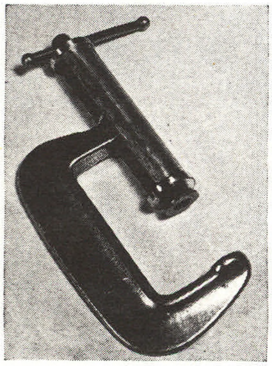
ALMOST every one who owns an aquarium has sometimes torn up aquatic plants while trying to remove fish with a net. This can be avoided by making a 90-deg. downward bend about ¼" from the mouth of the net, and straightening the handle with another 90-deg. bend as shown. This makes it easy to trap a fish against the glass side, as the offset handle clears the upper frame of the tank.—S. P. WIENER.

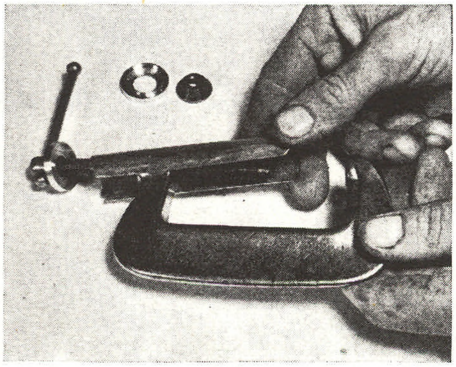


Old Water-Color Brush Serves as Handle of Stencil Knife

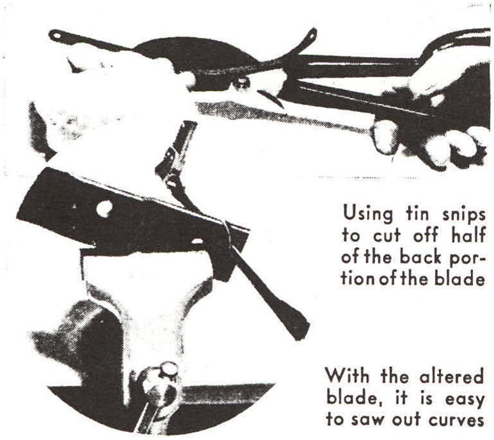
A FRISKET or stencil knife that has the same "feel" as a brush in an artist's hands can be improvised from a safety razor blade and a discarded water-color brush. Burn out the bristles, fill the hollow in the ferrule with warm sealing wax, and flatten by squeezing gently. Insert a piece of a razor blade, then squeeze the ferrule over it. Shape blade on a wheel, and hone it on an oilstone. To insert a new blade, soften the sealing wax in boiling water.—ROBERT BLICKENDERFER.

SHIELD PROTECTS WELDER'S CLAMP. Slipped over a clamp that is used for holding parts to be welded, this easily made shield protects the clamp screw from spatter and, as a result, insures easy removal when the job is completed. The shield consists of a split piece of light metal tubing and two recessed cap washers that are quickly turned on the lathe to the proper size to fit the clamp. Twist off the clamping foot at the end of the screw, assemble the guard as shown in the right-hand photograph, and rivet the foot back in place. It is advisable to braze the cap washers to the tubing, so that the shield will not be likely to slip out of them.—B. N.





Hack-Saw Blade Narrowed for Cutting Curves

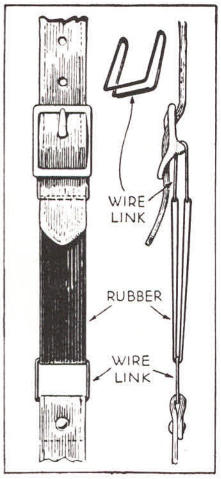


Using tin snips to cut off half of the back portion of the blade

With the altered blade, it is easy to saw out curves

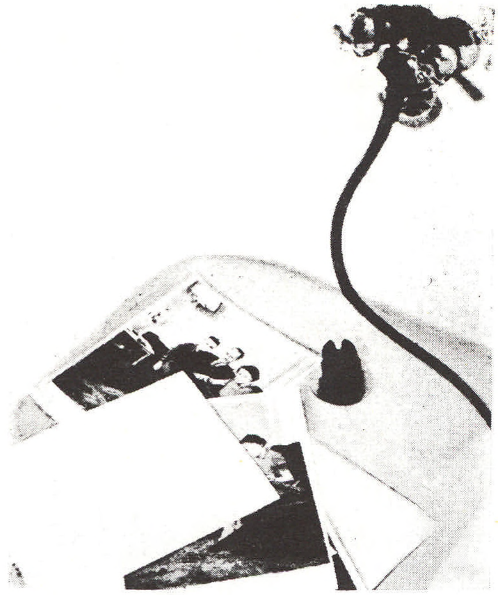
WITH an ordinary hack-saw blade it is practically impossible to cut curves. This can be done, however, by cutting off about half of the back portion of a flexible-back blade with tin snips as shown. It is wise to test the blade at the back edge before attempting to cut, as some varieties may be too brittle. If the blade can be bent with pliers, it may be cut. A blade so altered can be used to cut fairly small curves, as shown above.—BENEDICT BRONSON.

The links must be bent from stiff wire. Several can be made from a single wire coat hanger



Rubber Insert Keeps Strap Taut

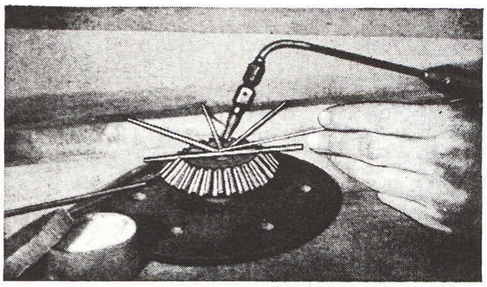
ARTICLES strapped to the package rest of a bicycle are less likely to jar loose if a heavy rubber band, cut from an old inner tube, is inserted in the strap by means of two wire links as above. Such a strap is also useful for clamping glued parts of irregular shape.—BERTRAM BROWNOLD.



Print-Washing Drain Made from Auto Radiator Hose

FOR washing a number of large prints, a bathtub, wash tray, sink, or lavatory can be used if the drain is fitted with the device illustrated. This carries away the hypo-laden water from the bottom and allows the surplus to flow over the top.

The washer consists of a 4″ length of automobile radiator hose of a diameter to fit into the drain snugly. A ⅜″ hole is cut in it about ½″ from the bottom, and three or four ¾″ deep notches are cut at the top. Push into the drain until the small hole is just above the bottom of the tub or sink.—W. L. BURKHARD.



Old Bevel Gear Spaces Rods While They Are Welded

WIRES, rods, or small tubes can be supported in practically any angular relation to each other while being brazed or welded together if an old bevel gear, screwed from underneath to a metal base, is used. The gear may have to be annealed before the screw holes are drilled.

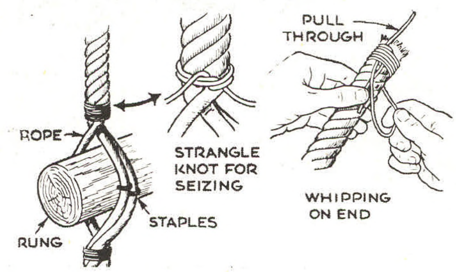
Easily Made Rope Ladder Is Useful Emergency Equipment

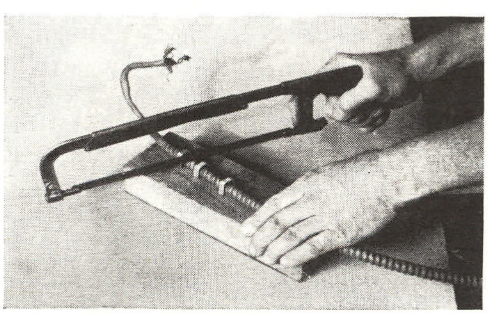
Wrapping an arm and a leg around a rope ladder gives support to the body in climbing. At right are shown details in the construction of a ladder

WHEN an emergency strikes, rope ladders are often highly desirable equipment, since they may be quickly put in position and are not hard to use. A feature which makes them especially convenient is that they can be rolled up for compact storage. They are also handy for access to a loft or attic where room does not permit installing a stairway.

These ladders are easily made from strong rope, 18″ lengths of oak 1¼″ in diameter, and twine. The rope may be used in two pieces or doubled. Unlay the strands at equally spaced intervals 12″ to 18″ apart, insert the rungs, allowing 1″ to protrude, and hold them fast with staples. Bind twine above and below the rungs.

Whip the rope ends by forming a circle of a 15″ length of twine, with ends overlapping 2″. Hold it against the rope so that one end projects a little beyond the rope end. Wrap the side of the loop which extends beyond the rope back around the rope. When the loop has diminished, hold as shown and pull on the projecting end of twine. Then cut off the loose ends.—WILLIAM H. DAVIS.





Block Holds BX for Sawing

ENDS of flexible armored cable or BX are hard to hold while being trimmed with a hack saw, but a device to aid in gripping them can be made as shown above by driving three BX staples into a 12″ length of two-by-four. A piece of rubber stair tread tacked to the bottom of the block keeps it from slipping on the bench.—C. L. S.

Rubber Tube Aids in Placing Steel Balls in a Bearing

THE always awkward task of replacing small steel balls in a ball bearing becomes a good deal easier if a piece of rubber tubing of suitable diameter is used to pick them up. Just press the end of the tubing gently on a ball. It will grip so that the ball can be lifted and put in place.—B. N.

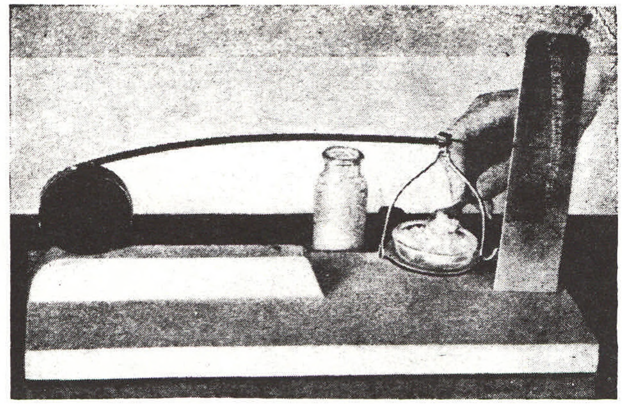
Sensitive Chemical Balance Made from Hacksaw Blade

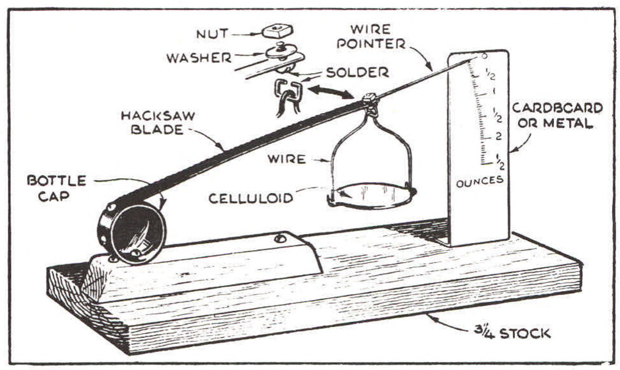
ACCURACY in your chemistry experiments, or in measuring photographic chemicals, will be increased by a sensitive balance. One that will measure to .05 oz. can be made from such simple materials as an old hacksaw blade, a screw cap from a canning jar, and a few lengths of wire.

Grind the teeth off and anneal, if necessary, to drill a hole about 2″ from one end; then drill two holes in the jar cap as shown so the blade can be bolted to it. Screw the cap to a wooden base through a third hole. Fasten the balance pan and a wire pointer at the other end of the blade, and set up a cardboard or metal scale on which the pointer will register. Calibrate with fairly new coins according to the following table:

Dime	38.5 grains
Penny	48 "
Nickel	77 "
Quarter	96.5 "
Half dollar	193 "

If you wish to calibrate a scale in fractions of an ounce, 437.5 grains equal 1 oz.—ROBERT F. BENENATI.

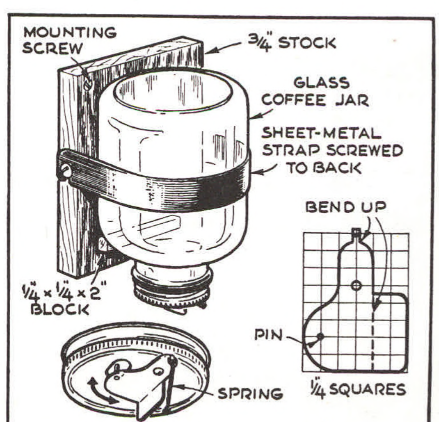


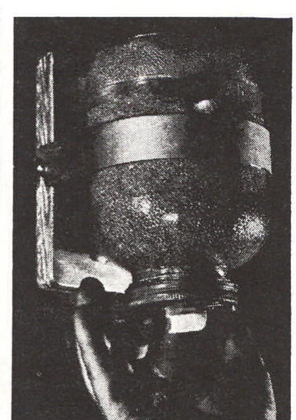


Simple Powdered-Soap Dispenser Utilizes Old Glass Coffee Jar

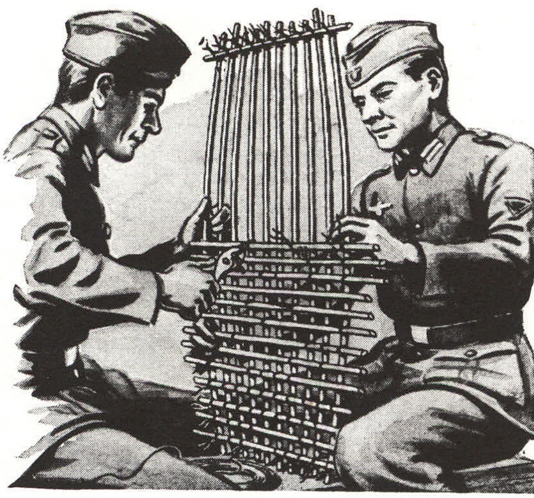
THIS soap dispenser is made from a glass coffee jar with a metal cover. Mount the jar on a ¾″ backing piece and hold it in place with a 1/32″ by 1″ sheet-metal strap, which is screwed to the back, and a ¼″ by ¼″ by 2″ block, which is also fastened to the back and prevents the jar from slipping down.

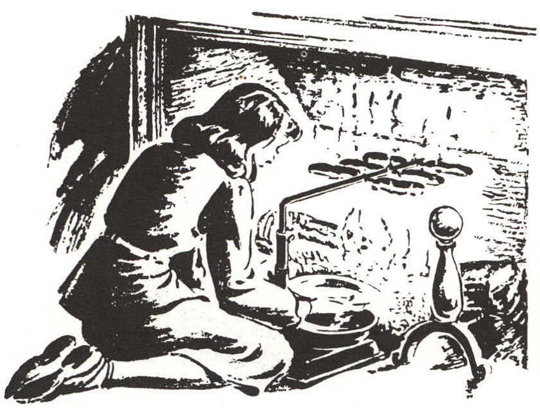
The dispensing device consists of a shutter which is detailed in the drawing; a 1/16″ pin, which is riveted to the shutter and passes through a hole in the cover to act as an agitator; and a return spring. The hole should be completely covered when the shutter is closed and partially uncovered when the shutter is open. A small machine screw and nut, the latter soldered to the cover, hold the shutter.—A. O. BOHN.

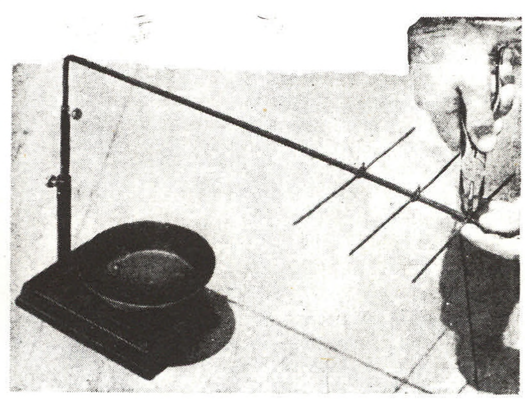




SWAMP SHOES, similar in construction and use to the ordinary snowshoe, are being used by German infantrymen for crossing swamplands. The shoes are built on the spot with long flexible sticks, which are usually found in such areas. As shown below, the pattern of construction is a simple one. The sticks are merely laid crosswise, and then fastened with string, wire, or pieces of tough grass. A flat piece of wood is then attached to the center of each shoe to keep the wearer's foot from crashing through it, and the whole thing is tied to the soldier's boot with pieces of wire. As with snowshoes, the wearer uses a straddle-legged technique in walking.



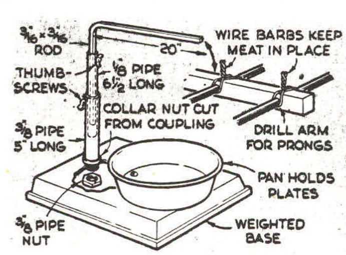




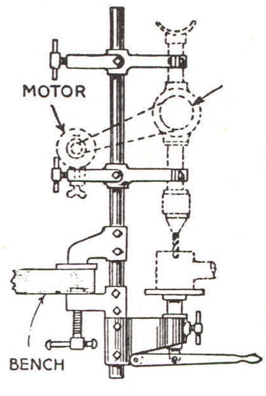
Adjustable Broiling Arm Telescopes to Suit Height of Fire

STEAKS and frankfurters can be broiled to the taste of the most discerning on this stand. It has an arm that can be telescoped to just the right height for any kind of fire, and is equally useful for winter picnics by a cozy indoor fireplace and for the garden and camping trips.

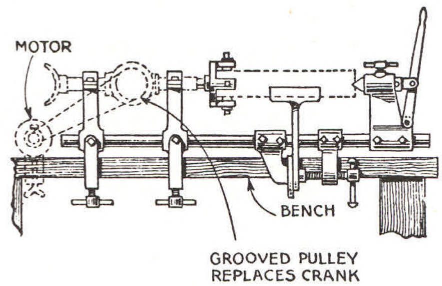
A discarded casting of suitable shape, a heavy pulley, or the bottom section of a laboratory ring stand may be used as the base, weighted, if necessary, by a piece of lead attached to the underside. The plate warmer may be a frying pan minus the handle.

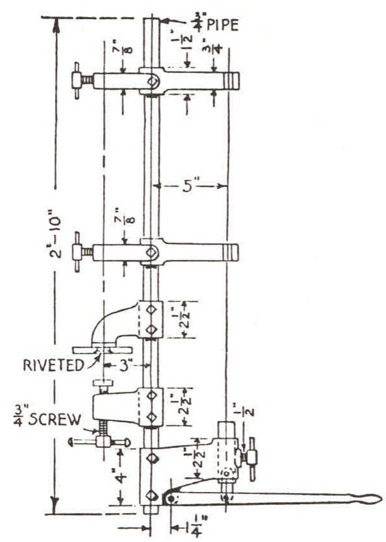


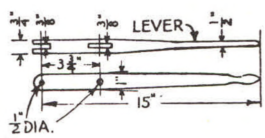
Two pipes that will telescope serve as the upright. Mount the larger on the base with two nuts, and drill and tap both for thumbscrews. Bend a length of 3/16" square iron rod for a 20" arm that will support a small steak or a dozen franks. Drill it for prongs made of 3/32" rod and barbed with wire as shown.—J. M.

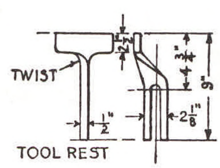


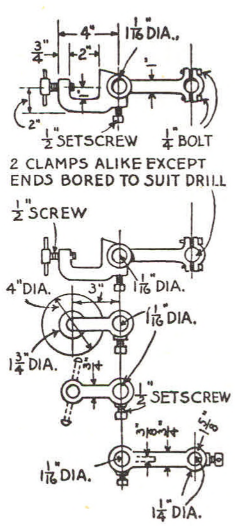
The attachments for using a breast drill as a bench lathe are shown above. The same attachments form the wall drill illustrated at the left. The details appear below

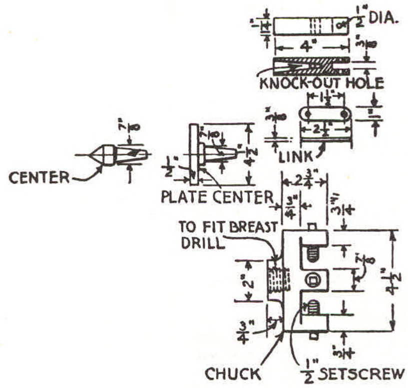












Attachments Convert Breast Drill into Small Lathe

A STANDARD 18-in. bench drill is converted into a simple lathe for small work by the addition of the attachments illustrated. The lathe will serve for either wood or metal turning when the work is light and within the range of hand tools. The same attachments also are used to provide a wall drill.

The flexibility of this combination tool for electrical work, building model machinery, and very light shop work, is obvious. Another advantage is that it may be attached to the edge of any heavy workbench and requires no special wall supports or stand.

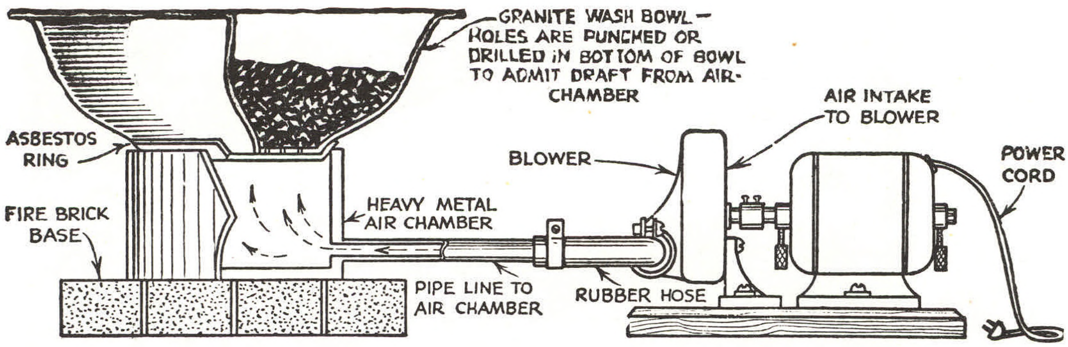
A grooved pulley is substituted for the drill crank. A small electric motor, such as a sewing machine motor, provides the power, or the pulley can be belted to the flywheel of a treadle.

A round shaft or pipe forms the main frame or bed of the machine. Two forged arms, made as shown, support the breast drill. The next member is a forged bracket with a faceplate that supports the frame when used vertically as a drill press, and holds the adjustable toolrest when the device is used as a lathe.

The tailstock is fitted with a sliding shaft and tapered center. A plate is substituted for the center when the machine is turned up to serve as a drill. A lever and link operate the sliding shaft in the tailstock.

The drill chuck is replaced, when necessary, with a simple chuck to hold parts up to 3 in. in diameter.

All the parts are fastened to the frame or bed with setscrews and can be adjusted to suit requirements. The breast drill can be removed and the crank replaced in a few minutes to restore it to its ordinary use.—G. L.



From Washbowl to Forge

The craftsman who works in metals can make for himself a forge that will fill all his workshop needs.

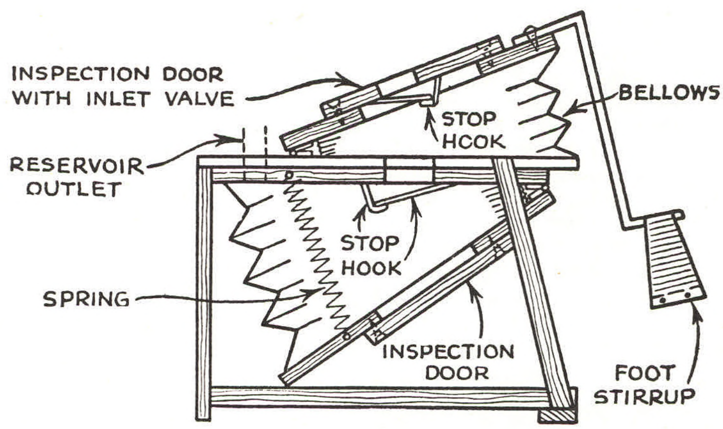
By NATHAN BOGOCH

IT IS not necessary to have an expensive forge for smith work. Anything to heat the metal in a good hard coal fire will serve as a container and firebox.

Here's an idea recently tried out in my home workshop. The forge bowl is made from a granite wash basin. A vacuum cleaner, reversed on intake and outlet to furnish draft instead of suction, with the blades trimmed to moderate the blast, was coupled to a tuyere box by a length of garden hose.

The forge is capable of bringing small work to adequate heat very nicely. Later a steam valve was fitted to the blast intake and the draft can now be controlled perfectly for annealing and carbonizing.

Several refinements have been suggested and the resulting simple, practicable forge is pictured here. You can easily make one like it.



Take a granite washbowl and punch out the bottom so that a cast iron stove lid of proper size can be rested on the bottom. Drill 1/4″ holes in two such lids.

Keep the pattern of the holes spread in one lid —this for open, large fires and general heating. The other lid should have three or four holes drilled near the center in an area no larger than a silver dollar. This is for bringing a small fire up, so as to heat bends and for localized upsetting. With these two lids acting as tuyeres (pronounced "tweers"—blacksmithese for forge air vents) controlled fires can be had through the medium of varying drafts and tuyeres sizes.

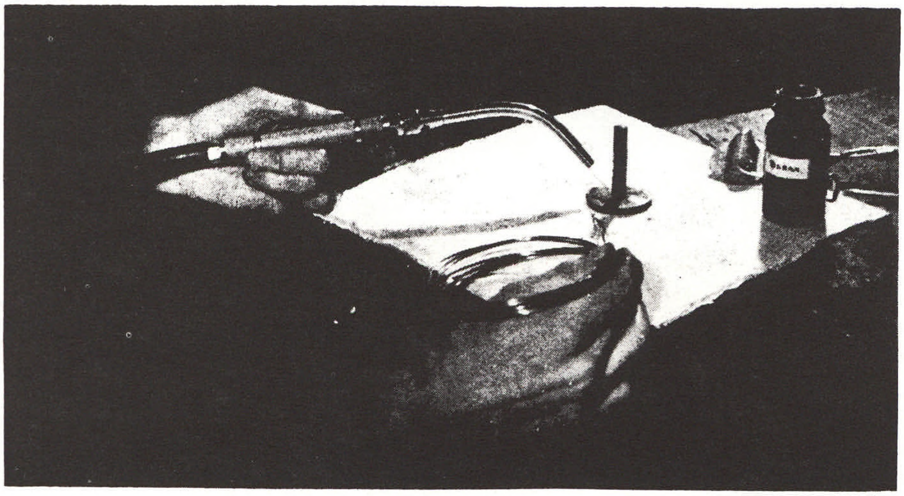
The forge should be mounted on a fire brick base. For an air chamber a piece of 6″ water or gas pipe can be cut to the proper height—COULD even be made as a stand, reaching to the floor. The fire brick must be under this air chamber for catching cinders. Preferably it should be demountable for cleaning.

Coal for forge work varies as to locality but most of it is known as semi-bituminous coal. This is a hard, small, very clean coal which kindles easily and burns steadily without a great deal of smoke. It can be kindled with a small wood fire. It is tempered with water to confine the fire to the desired part of the forge.

Such an addition will be welcome to the smithing equipment of any home workshop. It is cheap, adequate, ingenious.

An asbestos shield should be set up around the forge if it is to be used on a bench near a wall, to protect the wall from cinders and sparks.

Any home craftsman who wants to do much work in metals will soon find need for a forge. This inexpensive forge will serve that need well.



1

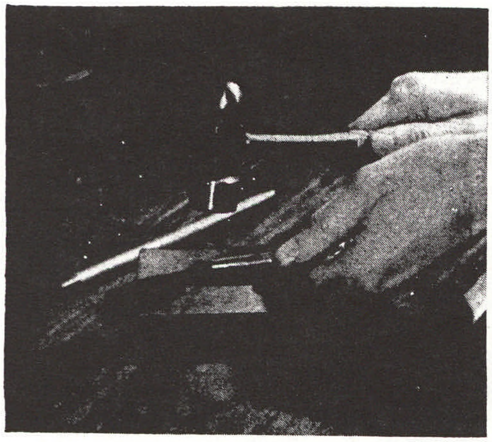
Acetylene Brazing Torch

REQUIRES NO OXYGEN

SOME of the uses you'll find for the acetylene-burning torch illustrated in Fig. 1 are melting aluminum and other metals, heating work that is to be bent, hardened, or tempered, and doing heavy soldering or light brazing. A small tank of acetylene gas will last the average home shop or small repair shop many months.

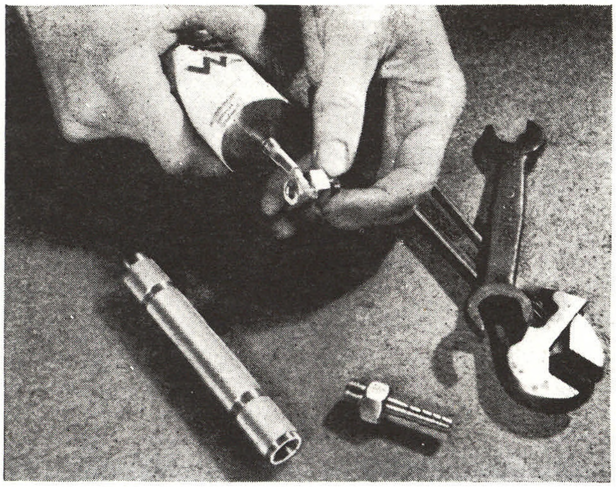
To make the handle, knurl a 4½" length of ⅜" brass pipe as shown in the drawings. Turn the trim bands, then square up and tap each end ½"-20. The end plugs are of ⅝" hexagon brass. A 1" section on one of these is turned down to 5/16" to form the hose nipple. This will make a tight fit in a ¼" hose. The other plug is threaded ½"-20 on both ends. Drill a 5/32" hole through each plug, coat the threads with oil-free gasket cement or shellac, and screw both plugs into the handle (Fig. 2).

Draw down the unthreaded end of a 4½" length of ⅛" brass pipe by hammering it, as shown in Fig. 3, to 9/32" outside diameter for the tip. Turn the outside to a smooth taper, drill the orifice out to 5/32", and bend to the shape shown.



3 Draw down the unthreaded end of a length of ⅛" brass pipe by hammering to form the tip

4 Inserting the jet in the air mixer. When it is in place, the threads must be a gas-tight fit



2 Before screwing the end plugs into the handle, coat all threads with shellac or oil-free gasket cement in order to have joints permanently leakproof

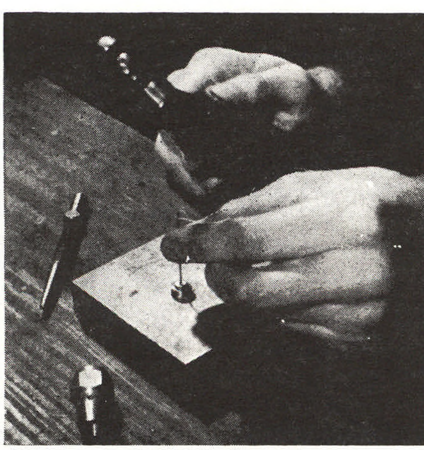
The air mixer is made from a 5/16" by 1⅛" brass tubing connector, which has a ½"-20 thread to fit the handle plug. Drill out the throat to within ½" of the end with a "Q" or else a 21/64" drill, and the end ½" deep with an "R" or 11/32". Tap the throat two or three ⅜"-24 threads, and the end with a ⅛" pipe tap. Face the end off square for a good fit against the plug; then drill three evenly spaced 3/16" air holes into the tapered part, placing these so that the jet orifice will be just behind them. The mixer with the holes drilled is shown in Fig. 4.

The jet has a slot so that it may be screwed into the mixer with a screw driver. Thread it back only far enough to bring the orifice where desired, so that the threads make a gastight fit. The orifice is the most critical part of the torch. It is nominally .010" in diameter, but must be made to suit the individual torch. If a drill of the right size is not available, use the smallest you have and tap the jet with a round-end punch to reduce the size of the hole. If the latter is thus made too small, it can be enlarged by driving a needle into it, as in Fig. 5.

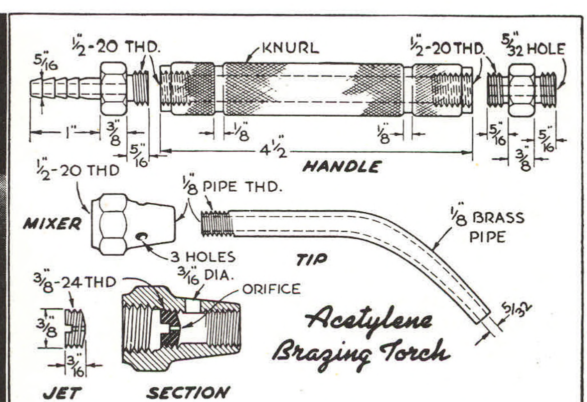
The flame produced should be an almost invisible blue, with a sharp inner cone of light blue-green. This color will remain constant at all working pressures. Since it is quite likely that the torch will not burn just right when first tried, the following notes may be helpful in obtaining the correct mixture:

If the torch burns with a white or smoky flame, the jet is much too large. This results in low gas velocity, which fails to pull in sufficient air. Also, check for leaks anywhere between the gas source and the jet. If the flame pops back to the jet repeatedly when lit and refuses to burn at the tip, either the jet is too small or the tip orifice is too large. A blue flame with a white instead of a blue-green center indicates that the jet orifice is just a trifle too big.

While the tip shown will take care of most work, larger or smaller tips may be made to give flames of various shapes and characteristics for differing types of work. The tips can be changed instantly as required, provided no gasket cement is applied to the threads. The cost of operation will be found amazingly low.—W. A. CONWAY.

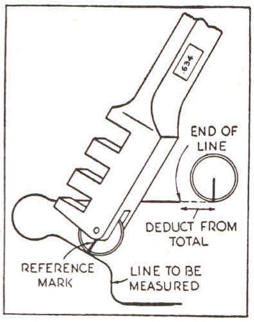


5 Should the orifice be made too small, enlarge it by driving a needle into it



Standard brass pipe and easily turned fittings are used as shown in the above drawing in the construction of this very useful little torch. It burns acetylene but requires no oxygen, and will be found adaptable to many purposes

Wheel of Glass Cutter Serves to Measure Irregular Lines



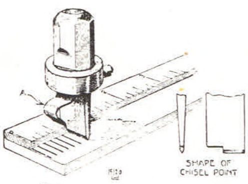
IRREGULAR lines on maps, patterns, or drawings can be measured with a fair degree of accuracy by the use of a common wheeled glass cutter. Make a reference mark on the wheel with drawing ink or paint. Carefully roll the cutter along a straight line for ten revolutions; then measure the length covered and divide by ten to find the circumference of the wheel. This figure should be marked on the cutter.

To measure a line, begin with the reference mark touching the starting point. Follow the line carefully, counting the revolutions of the wheel. Continue straight past the end of the line until the reference mark again touches the paper. Mark this point. Multiply the circumference by the number of turns. Deduct the distance traveled beyond the line.—ROLAND W. ZIEGE.

Marking Metal Surfaces in an Accurate Manner

SHOULD you need to mark, or graduate any flat metal surface, look at the illustration and you will discover about as simple a method as can be found, yet accurate in every way.

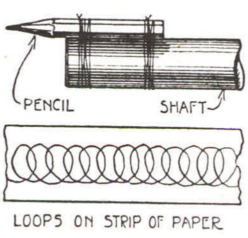
Grind your chisel point to the shape shown, then fasten an ordinary scale to the portion of the piece you want marked. The rest is easy, for with the spring piece *A*, which rests on each graduation of the scale, you can lay out whatever divisions you desire. As you hit the chisel on the head with a hammer and make one mark, it becomes second nature after a little practice to move the spring part *A* along to the next indented mark on the scale.—J. W. MOORE.



The spring permits the marker to move from one gradation to the next

Counting Revolutions by a Simple Method

TO ascertain the speed in revolutions a minute of a revolving shaft, attach a short pencil to the shaft in any convenient way, so that it will turn with the shaft, but will not run true; the sketch shows the idea.



The pencil revolving around the shaft records in loops on paper

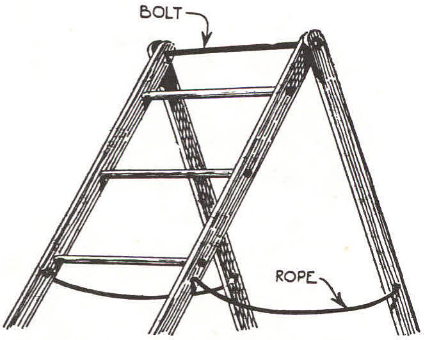
Tack a strip of paper to a smooth strip of wood. While the shaft is turning, hold the paper lightly against the pencil, moving it slowly lengthwise. The pencil will make a series of loops on the paper. By counting the loops the number of revolutions can be obtained, and by taking the time required to make the loops the calculation can easily be made.

This method will not answer for shafts that turn at very high speed, but for moderate speeds it is very useful.

Make a Step-Ladder from an Ordinary Ladder

IT is a simple matter to convert a short ladder into a step-ladder for use about the house. It is necessary only to drill two holes at the top of the ladder and attach two legs.

The legs should have enough strength to bear the weight of a person on the ladder

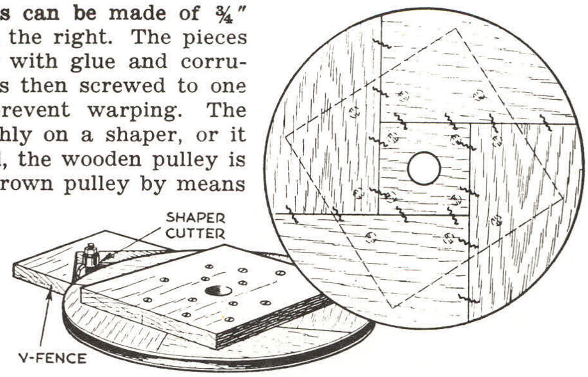


To make the bracing of the ladder more secure, the two props should be fastened together with cross-strips

and it will be found that pieces about 1½ in. thick and 2 in. wide will be necessary. Holes are drilled in the ends of these also and they are held to the top of the ladder by small carriage-bolts. Two pieces of cord prevent the legs from slipping too far.

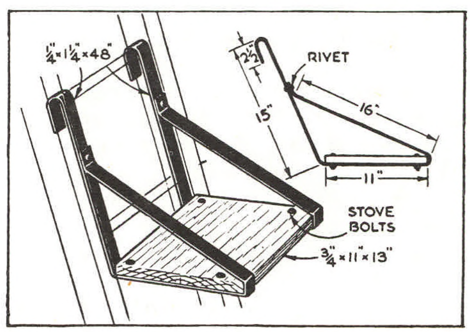
LARGE WOODEN PULLEYS for V-belts can be made of ¾″ thick wood as shown in the drawing at the right. The pieces are cut to shape and fastened together with glue and corrugated fasteners. A large square piece is then screwed to one side for additional strength and to prevent warping. The groove can be made quickly and smoothly on a shaper, or it may be cut with a chisel. When finished, the wooden pulley is attached to the side of the flywheel or crown pulley by means of U-bolts or heavy wire.

A single big pulley such as this will give the necessary speed reduction for operating a concrete mixer, corn sheller, cream separator, fanning mill, or other such equipment from a ¼-hp. electric motor.—R. E.



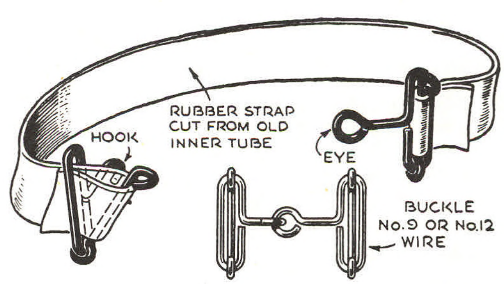
Platform Hooked on Ladder Rung Provides Secure Footing

A HANDY ladder platform may be made from two pieces of band iron, each ¼″ by 1¼″ by 48″, and a short board. Such a platform is safer and much more comfortable to stand on than ladder rungs, and is especially valuable when installing eaves troughs and the like, since it brings one alongside his work rather than underneath it. The band iron specified is probably too thick to be bent without heating, but a blowtorch will do the trick, or, if you have no facilities for such work, you can have the metal shaped by the local blacksmith. Bend the upper ends to hook well around the rung.—ALLEN G. BROWN.



Sure-Grip Wire Buckle Holds Straps Cut from Inner Tube

USEFUL rubber straps up to 7′ or 8′ long can be cut from old automobile inner tubes, but heretofore they have not been of much use because it was difficult, if not impossible, to obtain a suitable buckle or fastener. The homemade buckle illustrated at the right, however, holds a rubber strap firmly and never slips under tension. It can be made out of No. 9 wire, or even wire as small as No. 12 for straps up to about 1″ in width.

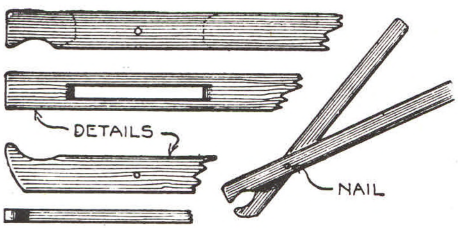


To function properly, the loose end of the strap should be on the outside or uppermost in the buckle. If the strap is attached to the buckle any other way, it will not hold under tension. A hook and an eye link the ends together.—ALFRED NEUMAN.

Tool for Handling Fuses for Heavy Voltage Currents

LINEMEN and electricians who have occasion to remove or install fuses in high tension lines will appreciate the little tool described below. This tool is simple and may be the means of preventing a severe burn or shock as a result of coming in contact with live wiring.

Cut off a section of broomstick about a foot long and saw a slot near



There is no possibility of a shock when handling high voltage wires if these tongs are used

one end about six inches long. Drill a small hole through tne stick at right angles to the slot and about halfway down its length. The slot should be at least one half inch wide.

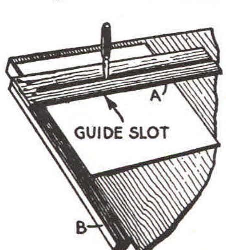
Next cut out a piece of hard wood the shape indicated in the illustration and fit into the slot, driving a nail through it and the holes in the broomstick so the combination will work like a pair of scissors.

Soak in melted paraffin and it is ready for use.

The fuse can be grabbed up with the aid of this tool without the least danger.—THORNTON HALLET.

A Trysquare with Knife Guide

CARDBOARD, heavy paper, tracing cloth and similar materials can be cut rapidly and accurately by using a trysquare made as shown. A slot just wide enough to allow the knife to work freely is cut through the center of a leg of the square, parallel with the edges. The square should be hard wood and all edges should be smooth. The knife is placed in the slot and drawn toward the operator.—JAMES E. NOBLE.

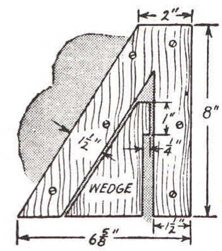


For cutting cardboard, paper and cloth

BENCH STOP FOR A WORKSHOP

By Tashio Fujioka

A necessary tool in a workshop is a bench stop where edge of long narrow boards must be planed by hand. The boards that cannot be held in a vise conveniently must be placed on top of the bench.



A good bench stop can be made by following the drawing and its dimensions. The material used is ¾ inch thick throughout. Saw out the part where the wedge is to be fitted.

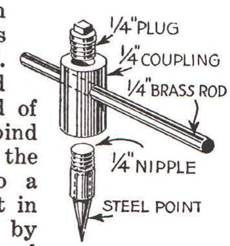
The wedge may be piece that was sawed out or some other piece that is cut to fit the notch. A ¼ inch rabbet is cut on one side of the wedge.

In use the board is placed against the rabbet and in the notch. The grip tightens as the forward pressure is brought to bear on the board being planed.

The bench stop is fastened to the bench top with 1¾ inch No. 10 flathead screws.

Simple Shop Trammel Made Mainly of Pipe Fittings

A TRAMMEL head may be made easily by using a ¼-in. pipe coupling, a ¼-in. plug, a ¼-in. nipple 1½ in. long, and a piece of ⅜-in. drill rod 1 in. long. Drill a ¼-in. hole in the coupling ⅜ in. from the end for the trammel bar, which may be ¼-in. brass or steel welding rod. The plug is screwed into the upper end of the coupling to bind this rod. Grind the short steel rod to a point and insert it in the nipple either by heating the nipple and shrinking it on, or by soldering or brazing the parts together. Screw the nipple in the lower end of the coupling. A piece of chalk or a pencil may be used in place of one of the steel points.—WM. H. WRAY, Toronto, Ont.

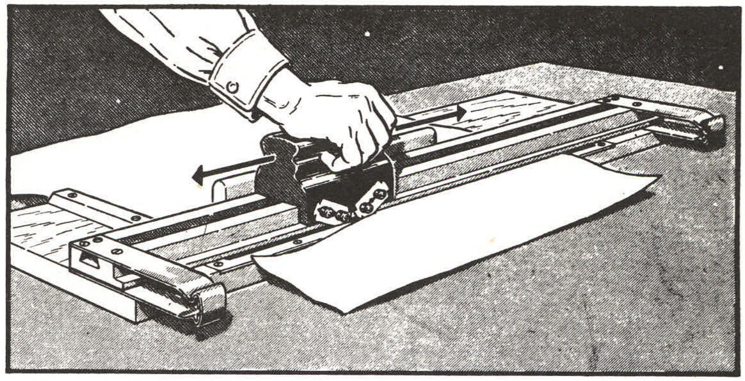


A trammel head

BY placing a worn-out three-cornered file flat on a piece of iron and striking it with a hammer so as to break off a small portion, I generally find a sharp corner left on one of the pieces that will cut glass as well as most commercial cutters. It adds another use to the worn-out file.—T. MCLAREN.

Handy Trimming Machine for Offices Uses Old Razor Blades

HERE'S a use for old razor blades. The trimming machine shown below may be maintained at no cost because its cutting edge is made of two used blades attached to a movable block. The block, which is operated by hand, slides on a track which also serves to maintain a firm hold on the material being cut. Designed to replace scissors, rules, and knives in engineering offices and blueprint rooms, where rapid cutting is vital, the device comes in four sizes—32, 38, 50, and 62 inches. It may be moved backward and forward and is said to assure straight and clean edges. Besides being useful in cutting drawings, tracing cloth, and photographic papers, this trimming machine, when used in shops, cuts other materials such as cardboard, skins, and leather.

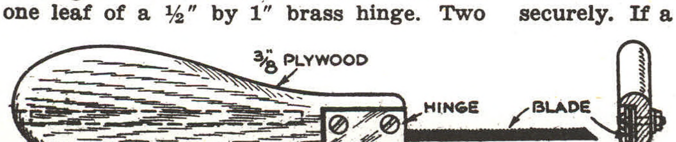


Fireplace Fitted with Socket for Removable Cooking Arm

SOMETIMES, especially in cabins and country homes, it is desired to hang a teakettle or a cooking pot in the fireplace. This can be done easily enough if a socket is permanently built into the side brickwork or masonry of the fireplace. A good socket can be made from a long 1″ pipe nipple with a 1″ coupling screwed on the end. The nipple serves as an anchor, and the coupling, short as it is, forms a sufficiently secure socket. Cement these parts in at a slight upward angle so that the arm, which fits the socket rather loosely, will project horizontally and not sag. The arm is a 20″ length of ¾″ pipe (unthreaded). It is merely pushed into the socket when needed. Any other size pieces of scrap that are available and will fit together as described may be used.—J. M.

Hinge Used on Handle to Grip Blade of Tiny Keyhole Saw

A DIMINUTIVE keyhole saw for use in model-making and other delicate tasks can be made from workshop odds and ends. The handle is shaped from ⅜″ plywood, and a rectangular section is rabbeted to receive one leaf of a ½″ by 1″ brass hinge. Two 3/16″ holes are drilled in the recessed area to match those in the hinge. Then a section of a coping-saw blade is laid in the hinge and both leaves are bolted to the handle with machine screws so as to clamp the blade securely. If a hole about 3/16″ in diameter is drilled in the opposite end, a handy receptacle will be formed in which additional blades can be kept at hand.—A. ALBANESE.

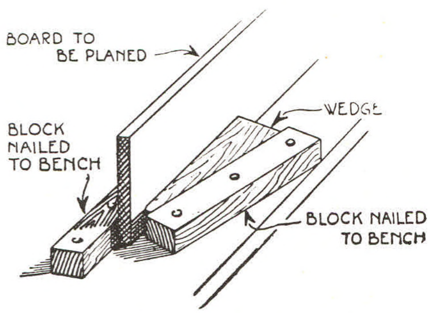


Vise Easily Made from Wooden Blocks

WITHOUT a vise it is difficult to plane down or otherwise work on a long strip of wood. A simple, but exceedingly effective, vise for holding the strip of wood to be planed can be readily made from a few small wooden blocks.

One of the blocks may be roughly cut in wedge-shaped form, and the two other blocks are merely straight strips. The two straight blocks are nailed securely to the face of a bench or other support, one block being nailed at an angle to the other.

The board or strip to be planed or otherwise worked on is placed between the two

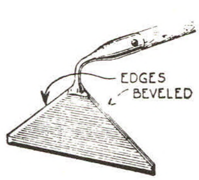


This block-and-wedge clamp holds boards as firmly as a bench-vise

blocks and the wedge-shaped block is driven in between the board or strip and the block nailed at an angle as shown. The strip is thus firmly held in place and can be planed in either direction without becoming dislodged.—HARRY G. SCHULTZ.

An Old Hoe Acquires a New Shape

SIMPLE but very handy is this garden tool made in a few minutes from an ordinary garden hoe. With a cold chisel



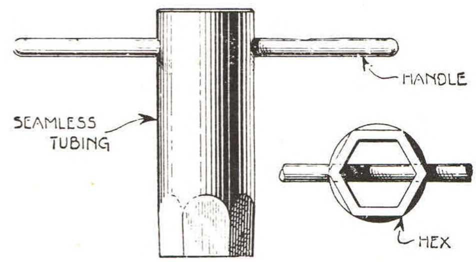
cut the hoe as shown in the illustration.

This gives a lighter hoe, and one that will scour much better and, best of all, it will reach between hills of vegetables, cutting weeds that the ordinary hoe will not reach. Be sure to sharpen the upper edges.—R. W. JAMISON.

A Wrench that Is Made of Seamless Tubing

A SOCKET-WRENCH is always a handy tool about a shop or garage, and at times it is indispensable. One that fulfills all the requirements of the purchased tool can be made easily.

The wrench shown in the illustration was made to fit the head of a 3/8-in. standard cap-screw with hexagon head. A piece of 1/2-in. seamless tub-

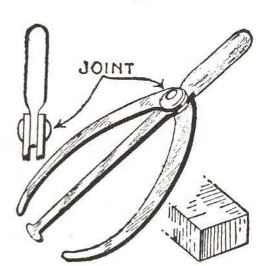


Key-wrenches are easily made of seamless tubing

ing was procured and the head of an old cap-screw ground to a taper. The end of the tubing was then heated and forced on the head. After heating again, the socket end of the tubing was forged about the head of a 3/8-in. cap-screw. The shank end of the wrench was drilled for a piece of 1/4-in. drill-rod, which was used as a handle.

By using various sizes of tubing, a complete set of wrenches may be made for either hexagonal or square heads. The shanks may be forged to fit a handle which is interchangeable with the complete set. If there is no seamless tubing to be had, iron pipe may be substituted, although it does not have the lasting qualities of the tubing.—LOWELL R. BUTCHER.

Double Caliper for Forge Work



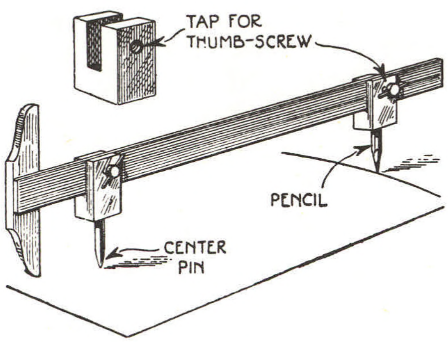
FOR measuring work that is being shaped at the forge, it is desirable to have a double caliper, as illustrated. It can be set for both width and thickness, and so will measure hot metal with the least waste of time.—G. A.

Why Buy a Beam Compass if You Can Make One?

BEAM compasses for drawing large circles are expensive. But if you have a long T-square, you can easily improvise a beam compass with practically no expense.

Cut two small wooden blocks and saw into each a slot fitting snugly over the blade of the T-square. Small thumbscrews, threaded through one side of each block, will hold the blocks in position.

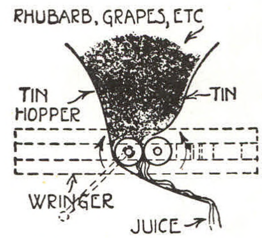
One of the blocks is provided with a needle-point, the other with a pencil. The diameter of the circle you can draw with this compass is limited only by the length of the T-square blade.—J. H. MOORE.



How you can change a **T-square** or ruler into a serviceable beam-compass

A Rhubarb Press Made from a Clothes-Wringer

AN old clothes-wringer was converted into a press for extracting the juice of rhubarb by the following procedure. The rubber rolls were removed, and in their place were substituted wood rolls. These rolls were cut round, of the same shape and size as the rubber rolls, and then sawed into equal halves. Notches were cut near each end to hold small wire flush with the surface of the rolls. Then a core was cut in the center of each roll the size of the steel shaft.



That old clothes-wringer will make an excellent press for extracting fruit juices

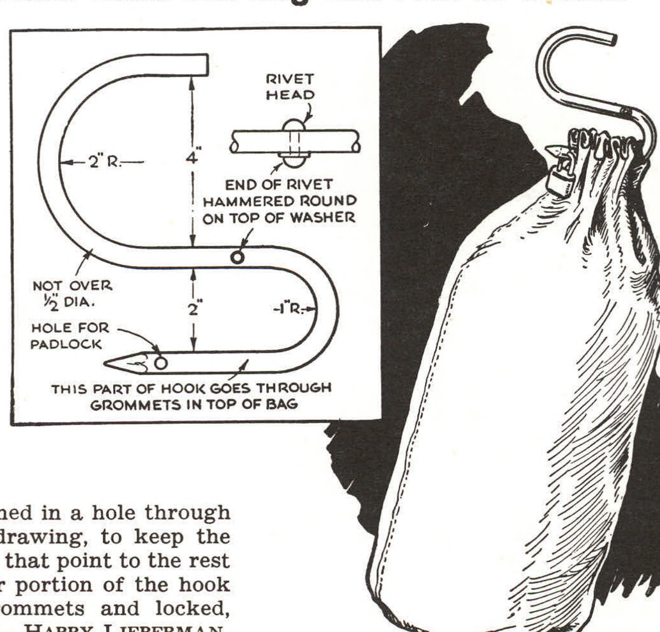
The rolls were then placed on the shafts and held firmly in place with the wire. With a stiff spring tension the juice was easily extracted from rhubarb, grapes, and other fruit. A tin strip, bent to shape, was tacked on to the bottom of the wringer posts, one on each side, to drain off the liquid into some receptacle.—DALE VAN HORN.

S-Shaped Metal Hook Locks Sea Bag and Acts as Handle

A SAILOR'S sea bag needs to be closed, locked, and carried just as does any other type of hand baggage. The device illustrated at the right does the complete job and, for that reason, was also one of the prize winners in the Service Men's Gift Contest.

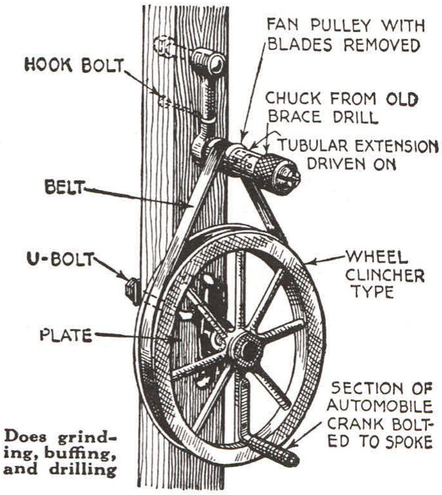
The lower end of the hook is rounded to a dull point for ease in threading through the grommets on the top of the sea bag. A hole is drilled through the hook to take a padlock shackle that prevents the grommets from slipping over the end of the hook.

A roundhead rivet is fastened in a hole through the hook, as shown in the drawing, to keep the grommets from slipping past that point to the rest of the hook. When the lower portion of the hook is threaded through the grommets and locked, the upper part is the handle.—HARRY LIEBERMAN.



Auto Wheel and Fan Pulley Form Grinding Fixture

A DRILLING, grinding, and buffing fixture can be constructed at little cost by using a flanged fan pulley, a clincher type automobile wheel, a ball-bearing spindle, a crank handle, and the chuck from an old brace. With the exception of the



Does grinding, buffing, and drilling

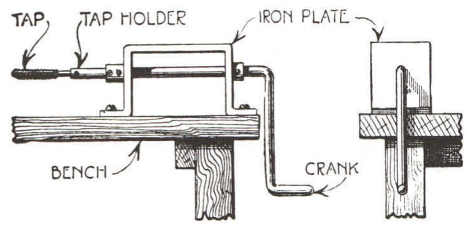
last, these are junk parts from a Ford or other light type automobile.

The wheel is mounted on the spindle and the crank is fastened with bolts to one of the spokes. The fan pulley is mounted on a fan frame bracket. Both these members are bolted in place, as shown, on a wooden column rigidly supported on the shop floor. A leather belt drives the fan pulley, the hub of which is extended by means of a length of pipe for holding the chuck.

Make a Tapping-Machine at Home

YOU don't have to purchase a high-priced tapping-machine if you adopt the idea shown in the accompanying sketch.

Rig up on a bench a piece of iron of the shape shown, place through this a shaft with a handle and you have a tapping-machine. The square end of the tap fits into a square hole of the



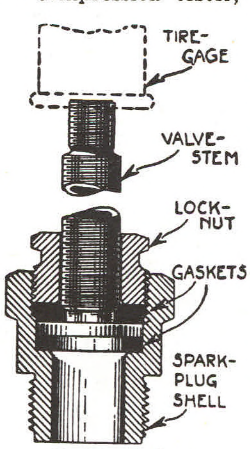
If you have much tapping to do, you will find this little machine a great help

tap-holder sleeve. With this machine you can tap all sorts of work at very little cost. The sleeve that holds the tap is removable, so that different sized ends to suit different sized taps can be used.

This simple machine means added production wherever holes have to be tapped, and, what is more important, it means fewer broken taps.

How to Make a Compression Tester Quickly and Cheaply

I HAVE found a simple substitute for the compression tester, which operates by putting it in place of the spark-plug, placing a pressure gage on it, and having some one turn the engine over against compression.

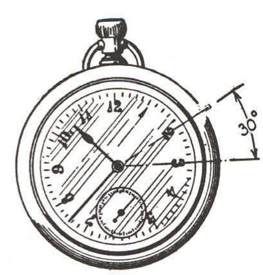


Sectional view

It was made from the shell of a spark-plug and the stem of an old inner tube. I placed a rubber gasket in the shell, filed the stem so that it would go into the shell also, put a small washer over the stem, and locked it in place with a locknut on the spark-plug shell. I then removed the valve-core and it was ready to use. It works perfectly and, in addition to that, costs nothing.—D. E. DARLING.

How to Use Your Watch as a Protractor

IT was quite by accident that the writer discovered that a watch made an ideal protractor in an emergency.



Here is a very old idea, but it is valuable to know in an emergency

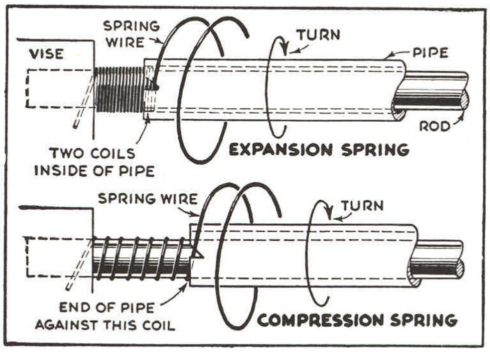
A circle consists of three hundred and sixty degrees; therefore each of the twelve hour spaces would consist of one twelfth of three hundred and sixty, or thirty degrees. Each hour is spaced off into five equal parts, so each space is exactly six minutes.

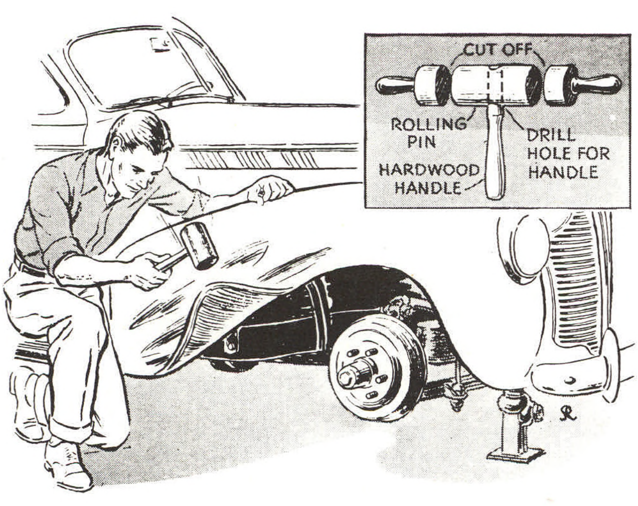
With a little care one can readily work to a degree with very good accuracy.—J. W. MOORE.

Making Springs by Hand

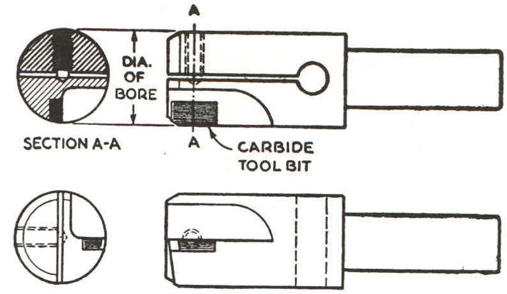
COMPRESSION and expansion springs can be wound on a rod with the help of a notched pipe having an inside diameter the size of the spring to be made. Clamp the end of a length of piano wire with the rod in a vise so that the wire is held at an upward angle. Saw a V-shaped notch in the end of the pipe, with one side parallel to the pipe axis. This should be the rear side of the notch as the pipe is turned.

Engage the wire in the notch, and turn it with the pipe, keeping the pressure uniform throughout. For a compression spring, space the wire; for an expansion type, hold the turns together.—A. H. VON DER OHE.





A GOOD WOODEN FENDER MALLET for hammering out dents in your car fenders can be made from an old rolling pin. Saw off both ends of the pin, leaving the center section about five or six inches long. Through the center of this, drill a one-inch hole at right angles to the axis of the rolling-pin section. Force a hardwood dowel tightly into the hole to provide a handle of appropriate length. I've been using such a mallet on fender work for a year and it is still good.—J. S.

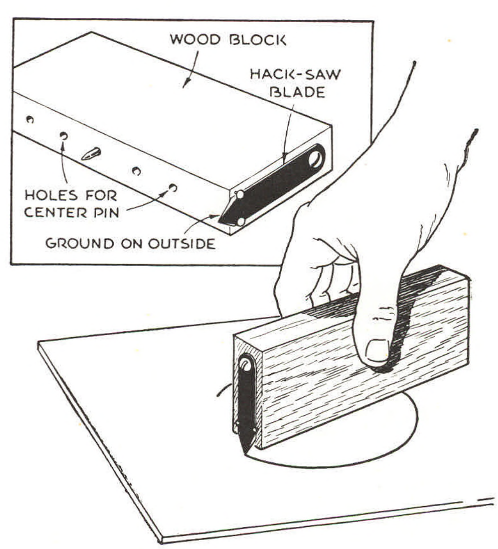


Shopmade Carbide-Tipped Tool Bores Cored Holes to Size

SUBCONTRACTORS and other shop owners doing production work will find the shopmade tool shown above very useful for precision boring of cored holes in castings. The body of the tool may be made of cold-rolled steel and casehardened. An expansion slot and a screw permit adjustment for wear and sharpening of the carbide tip, which is brazed on in the usual way. The shank is turned to fit into the tailstock ram, turret head, or other tool-holding device that is to be used.—U. G. DENSTEN.

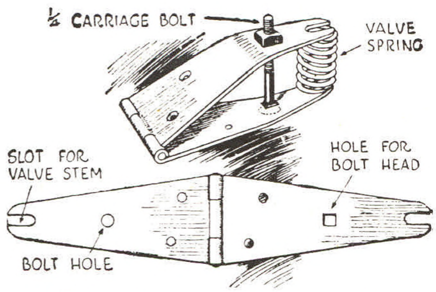
Hack-Saw Blade and Block Form Useful Fly Cutter

ROUND holes can be cut in cardboard for models, displays, and the like with a fly cutter made from a small block of wood and an old hack-saw blade. Drill a series of holes about ¼" apart in one edge of the block to receive the pin that serves as a pivot center for holes of various diameters. Break a short piece from the end of the hack-saw blade, grind it as shown, and attach it to the end of the block with a wood screw and two small nails. To make a clean hole, cut the cardboard first on one side and then on the other.—IRVING SALZER.



A Valve-Spring Compressing Tool You Can Make

ONE can buy millions of accessories and tools made for various purposes by inventors who have nothing else to do but sit and plan intricate arrangements for simple things. The writer has tried many different kinds of valve-spring compressing tools, but not until he used his own brains was he satisfied that the problem of compressing springs had been solved.



This valve compressor is made from a hinge and spring and is fully the equal of the kind you buy in the hardware stores

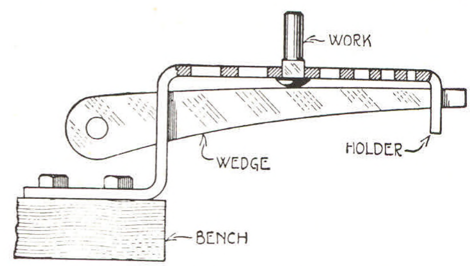
Any one with a drill and a hacksaw can make a spring compressor in ten minutes, a device that is guaranteed to be the best tool made for the purpose.

Materials required are an old door hinge and a ¼-in. carriage bolt. Cut a slot in the end of the hinge, just large enough to slip over the valve stem. Cut holes in the hinge for the carriage bolt and the thing is done. Slip the two leaves of the hinge over the spring; turn down on the nut and the spring is compressed. The spring may be left in the compressor until it is to be replaced.

Making a Suitable Holder for Pieces of Work

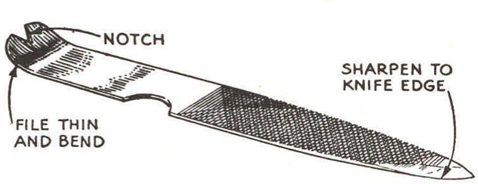
FOR the purpose of securing the piece operated on in a machine-shop, it is often necessary to construct a special holder, the shape and size of which must be governed by the particular conditions. For example, suppose that a bolt, rivet, or similarly shaped piece is to be clamped for an operation such as threading, filing, shortening, etc. Under such conditions, a device like the one illustrated may be used to advantage.

The holder shown consists of a bent metal strip with holes of various sizes for the bolts, and a wedge for securing the bolts in position. The wedge passes through suitable slots in the metal strip, which is bent down into the horizontal portion for fastening to the bench.



The wedge secures the bolt, rivet, or similar piece to be filed, threaded, or otherwise operated on

The bolt or rivet is inserted in the hole that fits its shank, and the wedge is forced into place by a couple of light blows from a hammer. When the work is completed, the piece may be removed readily by lightly tapping the end of the wedge.—H. C. RIDGELY.



Thumb-Tack Lifter and Knife Ground from Nail File

A HANDY tool for draftsmen and artists may be made from a small nail file as shown above. The notched end is used for prying up thumb tacks, and the knife edge at the pointed end for erasing errors and trimming paper and tracing cloth.—D. E. L.

Perforating Blank Forms

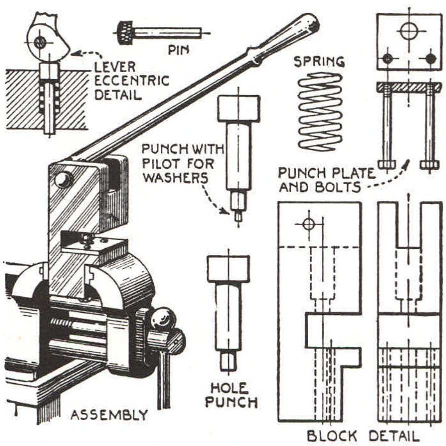
A SHEET of wire window screen and a knife or needle are all that are necessary to perforate paper or cardboard forms. The forms are laid on the screen and, if paper, a needle is drawn along a straight edge at the desired place. For heavier cards a sharp knife is used. The angle at which the cutting instrument is held and the mesh of the screen determine the fineness or coarseness of the perforation.

This expedient was found to work well in perforating the return blanks of a large number of shop forms when the regular perforator was not available.—H. E. B.

Hand Punch for Small Work Is Held in Vise

TIME and labor can often be saved in the shop if a small hand punch for the bench vise is available to handle work that cannot be done economically on a power punch.

The base of this small punch is clamped in the jaws of the vise and the lever pulled down by hand. Punches and corresponding punch plates are made to suit the work and can be changed readily. Two screws engaging tapped holes keep the punch plates



The vise punch ready for use and its parts

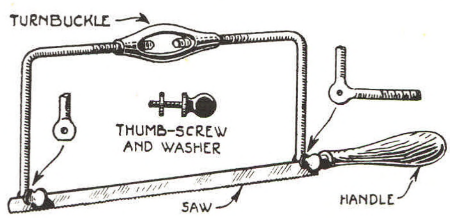
in place, and by removing the lever pin one punch can be substituted for another. When punches of large diameter are used for making up small washers, a removable pilot is screwed into the center of the punch, as indicated. Pilots of various sizes can be used with any one punch.

The base block and lever are forged steel and the cam end is hardened to resist wear. The lever is held by a removable pin, and a single heavy spring retracts the punch. All the punch bodies are the same diameter for interchangeability.—L. A.

Hacksaw Handle from a Buckle-Rod

TAKE the buckle-rod of an old bucksaw and make a serviceable hack- or scroll-saw handle. Remove the loop ends of the buckle-rod and bend each rod at right angle at equal distances from center. The space between the bends should be equal to the length of a standard hacksaw blade. One of the two bent-up ends should then be bent back at a right angle to form the handle and the other end should be cut off to make it equal in length to the distance between the back of the frame and the handle-bend.

Flatten the rod by hammering at the bend of the handle and at the other free end of the frame and drill holes for the

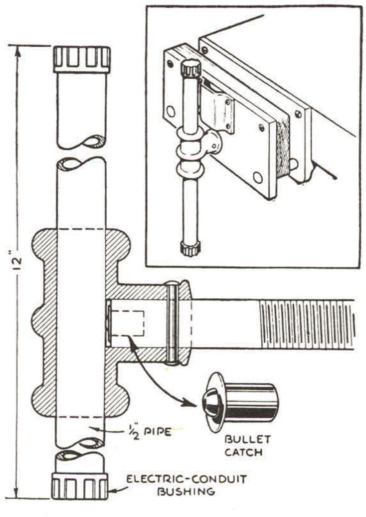


By means of the turnbuckle the saw tension may be regulated

thumbscrews with square nuts, which serve to hold the hacksaw blade. The tension of the blade may be increased by turning the turnbuckle in the back of the frame. If the handle-rod is long enough it may be bent into a loop to form a handle. If it is too short for that, it may be driven into a wooden handle.—M. J. MUNSON.

Bullet Catch Improves Action of Iron-Pipe Vise Handles

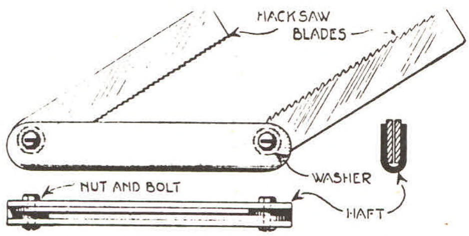
ONE school industrial-arts department replaced a number of broken woodworking-vise handles with 12″ lengths of ½″ pipe. Electric-conduit bushings were screwed on the ends of each piece, and to prevent these unbreakable handles from dropping noisily and from pinching fingers when carelessly released, a standard bullet cupboard catch was fitted into the end of each vise screw. This was done by driving out the rivet that held on the handle collar and drilling a hole of appropriate size lengthwise of the vise screw to receive the bullet catch, as is clearly shown in the drawing at the right. The collar was then replaced and the rivet peened over again to hold it fast. The handles work smoothly and have a neat appearance.—A. L. MAXFIELD.



Making a Useful Hacksaw for the Pocket

A GOOD way of utilizing broken hacksaw blades is to make a holder, or haft, similar to a pocket-knife.

Take a 4-in. length of ½-in.-diameter brass gaspipe, cut down on one side lengthways, and then flatten with hammer until a turn cap U shape is formed, just of sufficient width to receive two thicknesses of the saw-blades.



This shows how to make a folding hacksaw from broken blades

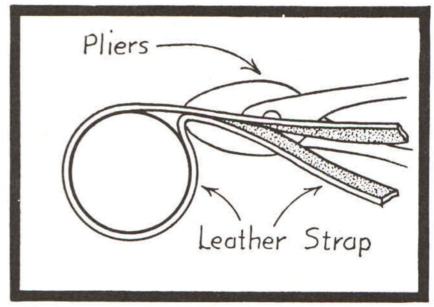
Half an inch from both ends bore a ⅛-in. hole, insert the eyelet end of a piece of the saw in haft, together with a clockmaker's small washer, and tighten up with small bolt and nut or a set screw.

The saw-blades, when not in use, will then fold over and fit in the haft like a penknife, and may be carried about in one's waistcoat pocket with ease.—GEORGE H. HOLDEN.

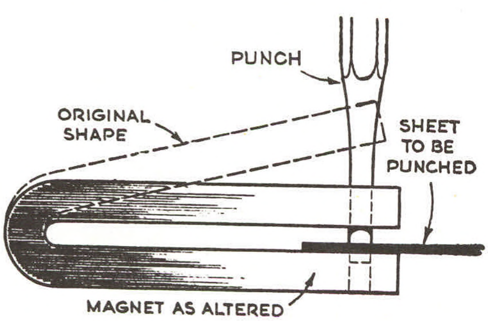
USEFUL "PIPE WRENCH" KINK

W. F. Schaphorst, Newark, N.J.

The sketch shows how easy it is to make a good "pipe wrench" out of a leather strap and a pair of pliers. Wrap the strap around the article to be turned, as shown, and grasp both ends close to the article with the pliers. If it is desired to tighten the thread, turn clockwise as in the sketch. If the thread is to be loosened, simply pull the other way just as with any regular wrench. This idea is of especial value where the article is nickled or polished and must not be scratched as the leather forms a cushion between the pliers and the metal. If it is thought that a single thickness of leather will not be strong enough, it is a simple matter to use two thicknesses or more. Thus, the method really has no size limit, provided one has a strap that is long enough.



Handy Punch Is Easily Made from an Old Car Magnet



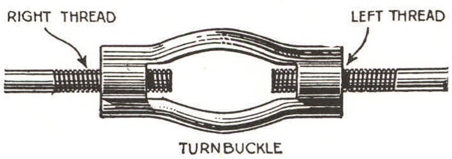
A MAGNET from a Model-T Ford can be made into a handy punch for sheet metal, clock springs, and the like. Heat and bend the legs of the magnet parallel as shown. Drill a hole through both for the size of punch desired. If you intend to punch holes in clock springs, the legs should be retempered.—C. G. GUTTINGER.

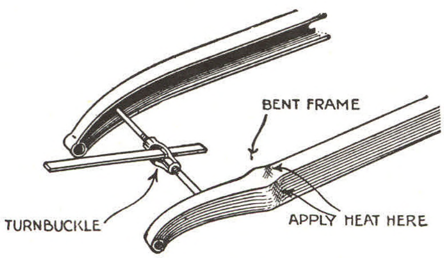
Grinding Old Files to Make Wood-Turning Tools

FILES are made from excellent steel, but it is neither safe nor wise to convert old ones into wood-turning tools unless the temper is properly drawn from them. One way to do this is to put the file on the grinding wheel and grind the teeth off, holding it against the wheel until the steel turns blue. Then let it cool slowly and it will be the proper temper for excellent cutting tools. Round files may be made into small gouges. Flat ones make good skew chisels, and the square ones, parting tools. This shop suggestion is worth remembering and applying these days when conservation of time and materials is so important.—J. J. EDWARDS.

How To Straighten a Bent Automobile Frame

It is not a difficult task to straighten a bent chassis framing, and very few tools are required. The necessary force can be provided with an ordinary turnbuckle, as indicated in the illustration. Various forms of jacks can also be used for the purpose, but the turnbuckle is the favorite of at least one repairman, who has applied it on

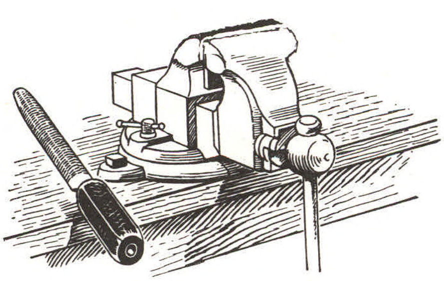




A bent framing can be readily straightened by means of a gasoline torch and turnbuckle

so many occasions that he has become an expert.

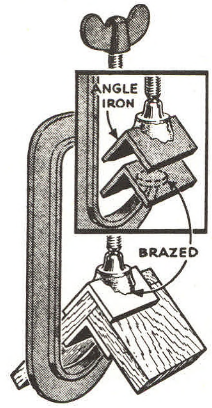
The heat from an ordinary gasoline torch is sufficient to soften the metal to the point of bending under the stress of the turnbuckle. Even a comparatively small torch can be used, as the idea is not to melt the steel but merely to reduce the bending point, and this is accomplished long before the melting temperature is reached.



Rubber Handles Improve Files

RUBBER bicycle-pedal treads, obtainable from a bicycle supply store or taken from an old bicycle pedal, make excellent file handles that will not come off in use, yet can readily be removed. The rubber is sufficiently flexible so that the file can be held easily in unhandy places and is less tiresome to grip.—KOUDY KENNON.

Angles on Clamp Line Up Corners



Two short lengths of 1" angle iron brazed to a C-clamp, as shown at left, provide a means for clamping right-angle joints. Mitered wood corners can thus be clamped for gluing, butt joints can be held in alignment for nailing, and metal corners can be supported for riveting or welding. Take care in brazing not to let molten metal get in the ball socket and destroy the free action of the moving jaw.—G. S.

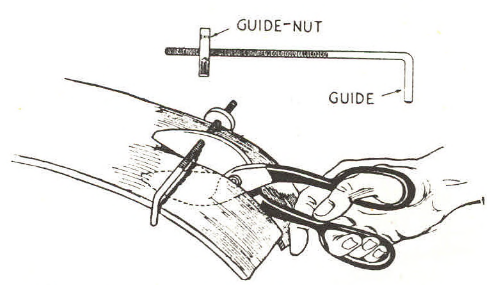
A Belt-Cutting Device on Tinners' Shears

When it is desired to cut belting or strips of similar material, the difficulty lies in keeping the strip of uniform width. With the attached device on a pair of common tinner's shears as a guide, the job can be done easily.

Drill a small hole near the top edge of the uppermost blade. Tap this hole and then provide a steel rod, threaded for a tight fit and long enough to include any width of belting you will cut. Bend one end of the rod at right angles to act as the first guide.

Thread the rod in the hole in the shears about halfway through. Then run a tight fitting, wide nut on the opposite end to act as a second guide. The assembled affair is shown in the sketch.

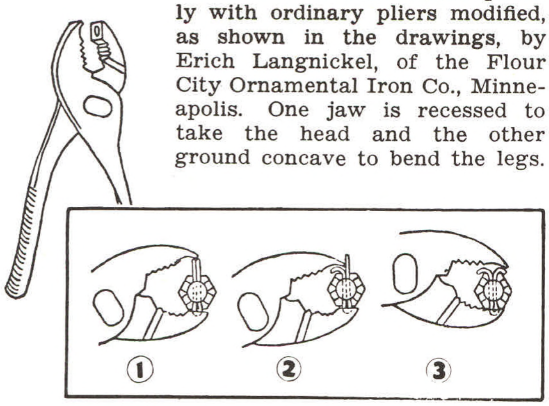
The distance of the cut from either side is determined and then the rod

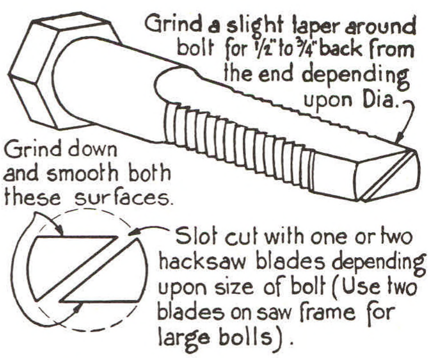


The scissors cannot help but cut a straight line because the guide directs them

and nut are adjusted so the blades will cut at that point and each guide bear on its own side of the stock. This keeps the shears from deviating from the intended line and insures a straight cut.

COTTER PINS are handled quickly with ordinary pliers modified, as shown in the drawings, by Erich Langnickel, of the Flour City Ornamental Iron Co., Minneapolis. One jaw is recessed to take the head and the other ground concave to bend the legs.





Home-Made Taps for Wood & Plastic

FOR THREADING holes in wood, plastics and soft metals, craftsmen will find these simple home-made taps indispensable. A variety of sizes can be made and if carefully used, sizes as low as ⅛" in diameter will be found serviceable. In choosing bolts that are to be converted into taps, select those that have coarse threads.

The first step is to slot each bolt with a hacksaw blade. Cut the slot to a depth of ¼", then carefully grind a slight taper at the end of the bolt, extending this taper back ¼" to ⅜" for small sizes, ⅜" to ½" for medium sizes and ¾" for larger sizes.

Next, finish the hacksaw slot for almost the entire length of the thread. As shown in the sketch, two flats are ground or filed on opposite sides of the bolt to produce the cutting edges. The bolt head may be cut off with a hack saw and the round end shaped square so that it can be fitted in the standard tap wrench. Larger size bolts may have a ⅛" or 3/16" hole drilled through the shank to take a steel pin 3" to 4" in length to be used for driving the tap.

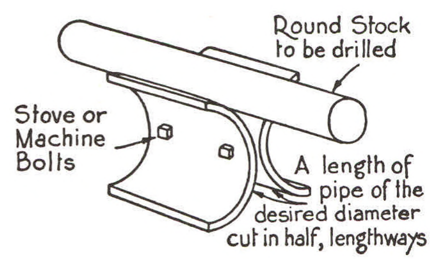
If a long-lasting set is desired, use bolts made of a good grade of steel. After they have been converted, have them case-hardened.—*C. L. M.*

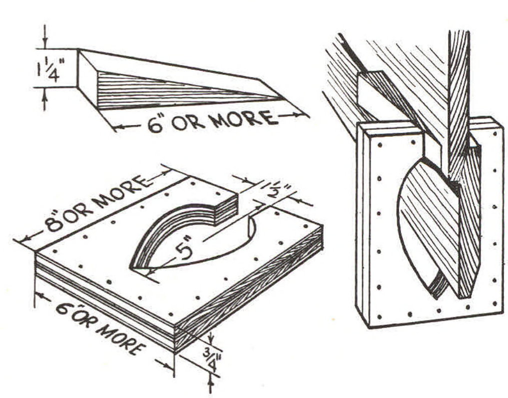
Handy V-Block Made from Iron Pipe

WHENEVER round stock must be drilled on a drill press, a V-block is indispensable for holding the stock. Some craftsmen have one V-block of a certain size, but few have a complete set for handling material of widely varying diameters called for in shopwork.

It is not hard to make a V-block, or even a set, if the desired sizes of pipe are carefully sawed lengthwise through the center, as in the accompanying sketch. This work is done with a hack saw. The sections are fastened together with bolts so the round surfaces of the pipe touch one another. The lower edges of pipe form a natural base which will rest evenly on the drill press table.

If only one V-block is made, and at a later date it proves to be too small for a certain job, the capacity can be increased by removing the bolts and placing a length of strap iron of the desired thickness between the two halves and bolting the combination together. Of course, the strap iron must have holes drilled in it to conform to those in the pipe halves.—*C. L. Meehan.*

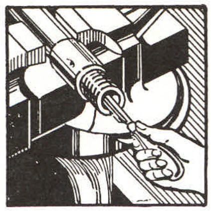




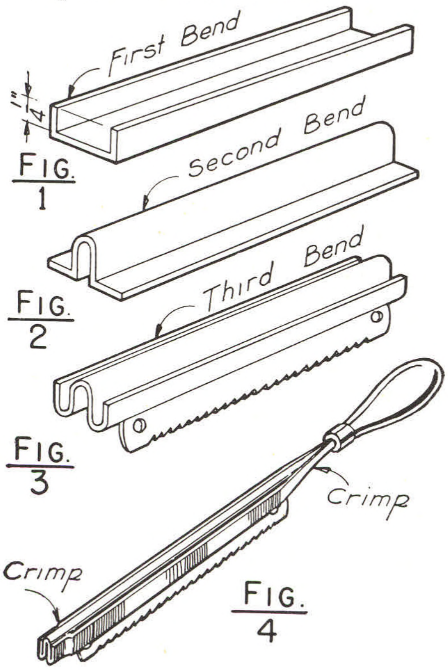
Boat-Planking Clamps

IF YOU do not have enough large screw clamps to hold the planks while fitting and riveting a small lapstreak boat, make up a dozen wedge clamps from two layers of ⅜" plywood as shown above. The inner portion of the jaws is sawed larger so the clamps can be used on curves.—J. W. RANKIN.

Hack Saw for Tight Places

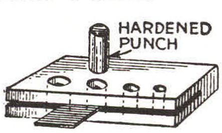


CUTTING metal with a hack saw in close quarters where the conventional hacksaw frame will not fit, can easily be done by the preparation of a blade holder similar to the one shown in the sketch. A piece of 26- or 28-gauge sheet iron 1" wide and 16" long is required for the blade holder.



The bending of the metal can be done in a machinist's vise or over the edge of a piece of hardwood with the aid of a hammer. The first bends to be made are shown in Fig. 1. The second bend shown in Fig. 2 can be started over a beveled piece of wood and completed with the aid of a hammer. The third bend shown in Fig. 3 must be made with the hacksaw blade in place. The simplest way of completing this step is to apply the pressure between the jaws of a machinist's vise. The final step consists of crimping the ends of the metal as shown in Fig. 4, then applying the handle.—*Fred Henkel*

A Quickly Made Punch

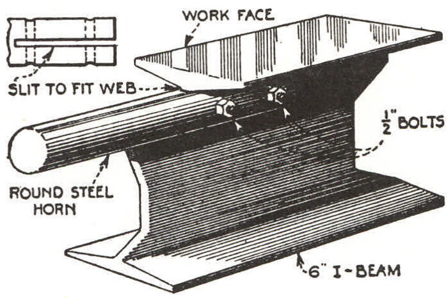


PUNCHES of various sizes are often useful about the workshop. The writer recently made a set of five punches by the method illustrated. A slot was cut in a steel plate with a hacksaw and the holes were drilled through. The punches were made of drill rod with hardened ends.

The sheet metal is placed in the slot and the punch is struck a sharp blow with a hammer. This is sufficient to punch holes in 20-mill stock.

I-Beam Anvil Cheaply Made for the Small Shop

A SERVICEABLE anvil for the home or farm shop can be made from a piece of scrap I-beam and a short length of round steel. The I-beam usually can be picked up in any structural steel shop for a few cents a pound. It is cut to the shape indicated with a hacksaw and the edges are rounded with a file.



For the farm or home shop, this inexpensive anvil serves for many purposes

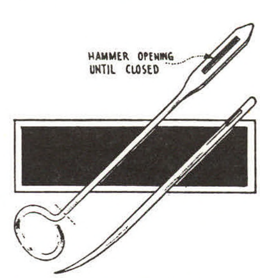
The horn is slotted to pass over the central web and rests on the projecting front support, as shown; two ½-in. bolts hold the horn to the anvil proper.

If a tapered horn is desired, take the round iron to a blacksmith's shop and have it forged to a taper. For ordinary use, however, a straight horn serves very well and it can be made in any length to suit special jobs. A long horn makes an ideal riveting anvil for tinsmiths in working up tubes and pipes.

The anvil can be fastened either to a workbench or to a regular anvil base with railroad spikes.—J. R.

Making a Harness Needle from a Can Key

ONE day, having occasion to use a harness needle, I found that I had lost the needle and could not obtain another that day. I took a key such as is used to open sardine-cans and cut it off below the curved end that serves as the handle.

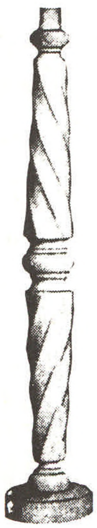


A sardine-can key converted into a harness-needle

Inserting the tip of a screwdriver into the slot, I hammered the side of the slot near the handle part until it was quite closed. I filed the cut-off end to a point, curving it a little, and thus obtained a very serviceable needle.

A Jig for Spirals and Flutes

R. W. STEWART



B

C

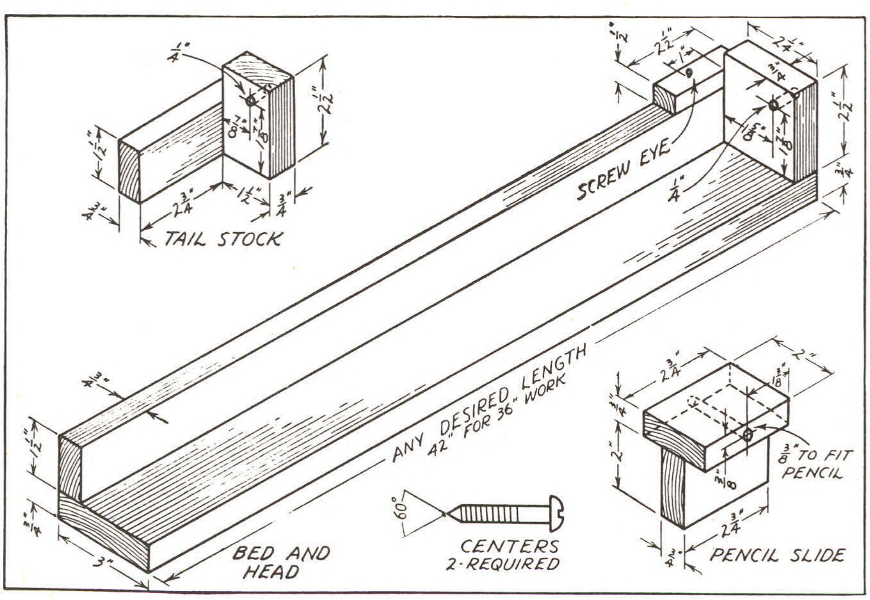
Kinds of spirals and fluting which may be marked off with the jig and attachments described. A—Right and left hand spiral. B—Fluting. C—Single right hand spiral. D—Double left hand spiral.

A

D

MANY methods of laying out spirals have been published from time to time, all of which served their individual purpose perfectly, but the jig herewith shown is universal in its application, and will prove a valuable permanent addition to the equipment of the home workshop. It will accurately and quickly lay out any spiral of any lead, right or left hand, on straight or tapered work. It may also be used to lay off work to be fluted. It makes duplication simple, fast and accurate.

A jig made to the dimensions shown will handle work up to 3″ diameter and 36″ long. The dimensions may be changed to fit individual requirements. To make the jig, use any straight finished lumber. The one here described and shown is made entirely of white pine ¾″ thick.



The jig consists of three parts, which, for convenience have been given the same names as the parts of a lathe, namely: the bed with head attached, tailstock and slide. The drawings give all necessary details for the construction of the three units, and each is clearly marked. The centers, noted on the drawing, are made of two ¼″ x 1½″ stove bolts. The threaded ends of these are ground to an approximate 60 degree cone point. These are inserted in the holes of the head and tailstock with the points toward each other, secured with nuts.

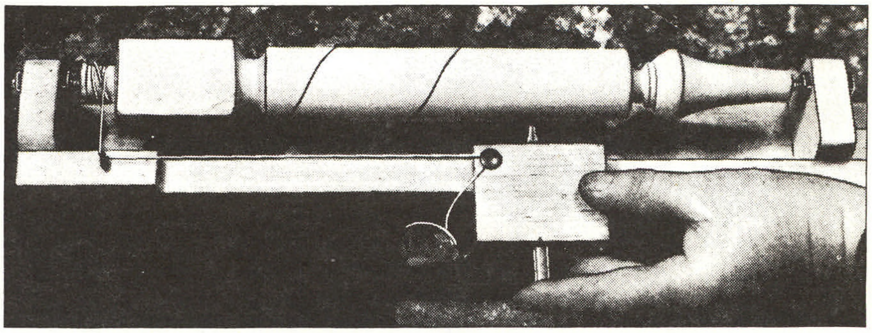
In turning the piece to be laid off, proceed in the usual manner, except that on one end for a length of about 1″ turn to a diameter, the circumference of which is equal to the desired lead of the spiral. Rather than go to the trouble of finding the diameter mathematically, take a strip of paper about ½″ wide and of a length equal to the lead of the spiral and turn the piece until the paper strip just reaches around it.

If a spiral with two, three, or more grooves, lay off on this circumference as many equal spaces as the number of grooves desired. This, too, may be done with a piece of paper of the proper length laid off as necessary, marking the work from the marks on the paper while it is wrapped around the work. If the spiral is to be single cut, of course, no laying out is required.

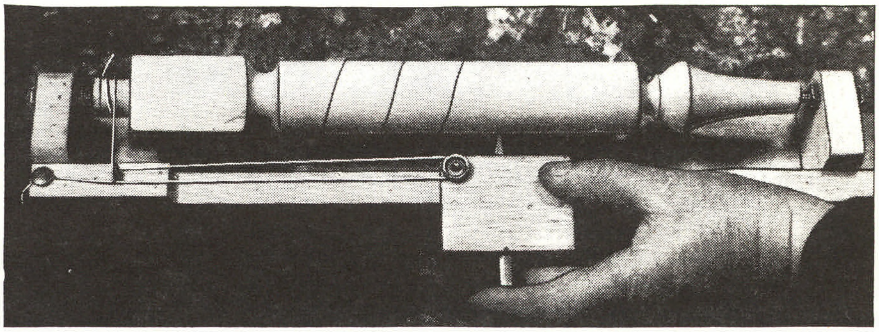
Drive a small brad into the work on each index mark near the end, leaving about ¼″ extending from the work.

Placing Work in Jig

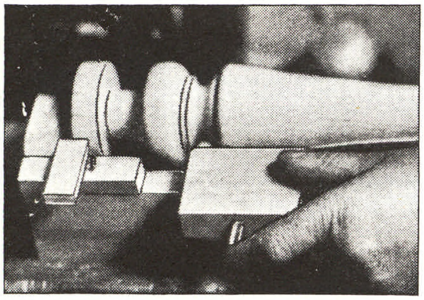
Now, place the work in the jig with the centers in the center holes of the work, holding the tailstock in position with a small clamp. Have the centers tight enough so the work turns with a slight drag. Procure a piece of fairly heavy string; fish line will serve nicely. This should be somewhat longer than the length of the spiral to be laid out. Make a small loop in one end. Do not use a slip knot. Pass the loop thru the screw eye and place it over one of the brads. Wrap the string around the work smoothly by turning the work and holding the string taut. When string of a length of the spiral, plus half to one and one-half turns, has been wrapped around the work, place the slide on the bed in such position near the head that the slide will move about 1″ before the pencil contacts the work.



The set-up for marking a spindle for spirals, with the string attached directly to the slide.



The arrangement, showing the same spindle, with the small pulley and double string. The spiral lead is half that of the other set-up.



The jig and attachments used in marking legs for fluting.

With the string taut, fasten it to the slide with a thumb tack or small screw and washer.

With a thumb or finger pressing the pencil against the work and the slide held firmly against the bed, move the slide the length of the work to be laid off. As the slide moves along the work, the string unwinds, rotating the work, and the pencil marks the predetermined helix. Place the loop in the string over the next brad, and repeat as often as necessary.

If the lead of the spiral is such that the indexing end of the work is too small to rotate the work without too much strain on the string, turn the work to a size which will give a spiral of twice the length desired.

Use of Small Pulley

Make a small grooved pulley about ⅝″ in diameter and attach it to the slide instead of the thumb tack. Pass the string around this pulley and anchor the free end at the head end of the jig by any convenient method, and proceed as before. With this arrangement of the string, the work will rotate at twice the speed and, therefore, mark a spiral of half the lead as would be the case if the string is connected direct to the slide. This will require a string of approximately twice the length required as when the string is attached direct to the slide. Refer to the photographs. Whether the string be wrapped over or under the work determines the hand of the spiral—either right or left.

Laying Off Flutes

For laying off flutes, turn as large a diameter as practical, or attach a disc to the end of the work, and lay off as many equal spaces as there are to be flutes. Attach a pointer to the bed of the jig with a brad or screw. Index the work by this pointer and the marks on the large circumference of the work or disc, and use the slide as for spirals, without a string, holding the work so it cannot rotate. See photo. In laying out flutes on irregular shaped work, it is necessary to start the mark on a large diameter and mark towards a smaller, as the pencil may refuse to move outward when the diameter increases abruptly.

As the lead of the spiral remains constant for any given lead, the angle of the helix remains constant on cylindrical work, but on tapered work the angle will constantly change, which gives the impression that the lead changes as the diameter decreases or increases.

How to Work Under a Car Without a Pit

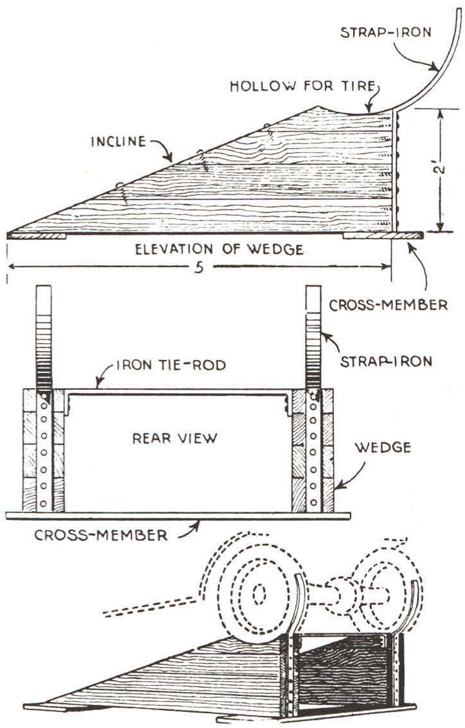
WHEN trouble occurs either with the under side of the automobile motor or the rear end of the car, it is somewhat inconvenient to work without a pit.

To partially overcome this condition a garage man built a sort of runway, as illustrated, by which the end of a car could be quickly elevated about two feet off the floor, thus allowing fairly easy access to the parts.

Two wedge shaped pieces were constructed of heavy spruce timber, 5 ft. long by 2 ft. high in the rear. The inclined ends of the timbers were fastened together by lag screws and the vertical backs secured to each other by a length of strap iron. The horizontal surface of the uppermost timber was hollowed out to receive the tire and the strap iron was continued outward in a corresponding curve which acted as a bumper to prevent the wheel running off the back of the support.

These two wedges were then bolted together at the bottom with two cross members, as shown, so they were just the width of the tread of a car.

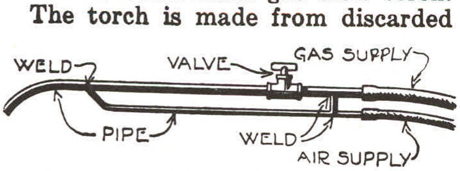
The car can be run up this incline either by power or by hand and the necessary work done with a minimum amount of inconvenience and labor. Of course it is not necessary to mention that it saves the repairman's back and nerves.—THORNTON HALLETT.



Run your car up the incline and work beneath it with ease. The contrivance is easily made and pays for itself in a short time

To Make a Handy Gas Soldering Torch

SMALL soldering jobs which must be done in cramped quarters can be quickly and easily accomplished with this home-made gas blow torch. The torch is made from discarded pipes and fittings, the illustration showing plainly how it is assembled. The torch is attached to the gas main by a length of rubber hose, while another piece connects with the air line.—RONALD L. PRINDLE.

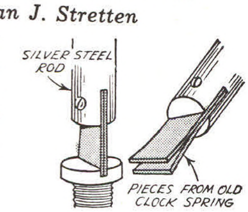


This gas torch is simplicity itself and serves exactly the same purpose as the expensive manufactured article

UNIQUE SCREW-HOLDER

By Ivan J. Stretten

A rather unique and handy tool for holding screws that must be inserted into awkward places, can be easily made with a rod and a couple short lengths of clock spring in the following manner:

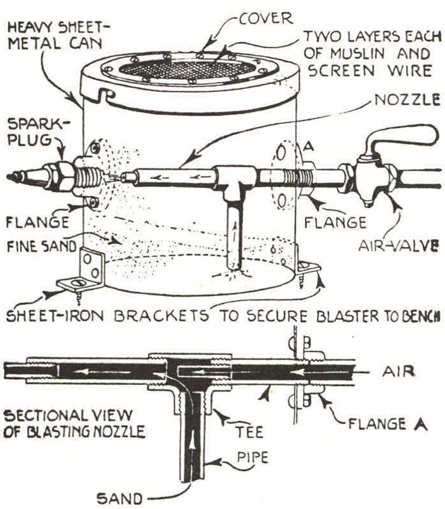


First one end of a length of mild or silver steel rod is slit with a hack saw to a depth of approximately half an inch. Then two strips, about one inch in length, are cut from an old clock spring. These strips of spring are then placed in the slit in the end of the rod, and the whole is held together solidly with a rivet, as shown in illustrations.

Sand Blast Cleans Spark Plugs Quickly and Easily

TO CLEAN the carbon entirely from the porcelain of a spark plug is difficult even if the porcelain is removed from the shell, and in non-separable types of plugs it is even more tedious. The porcelain can, however, be cleaned thoroughly by sand blasting in a few seconds.

The illustration shows a fixture into which a spark plug can be screwed and the garage air supply used to scour the porcelain with sand. The casing can be made from any heavy sheet metal can or box. Two flanges are riveted into the sides exactly opposite each other. One serves as a fitting into which a spark plug can be screwed; the other as an air connection.



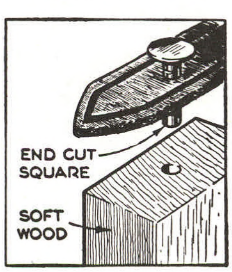
Phantom view, showing the cleaner in operation and section of the nozzle

Make a blasting nozzle of short sections of pipe and connections, as shown. The lower end of this T should be about ½ in. above the bottom of the casing. Cut out the top of the can or casing and rivet in place two layers of muslin between two layers of screen wire.

Place ordinary building sand to a depth of ¾ in. in the bottom of the can, screw in the plug, and turn on the air. Renewal of the sand is occasionally necessary.

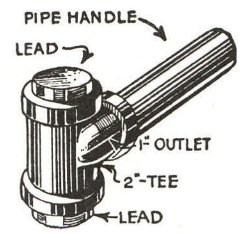
Square-Cut Nail Serves as Punch

WITH the end filed off perfectly square, a wire nail serves as an excellent substitute for a leather punch. Select a nail the size of the hole desired and drive it through the leather into the end grain of a block of soft wood. The idea also will work on many other materials, including light metals. In the latter case, a hardwood block should be used.—FRED W. CARTER.

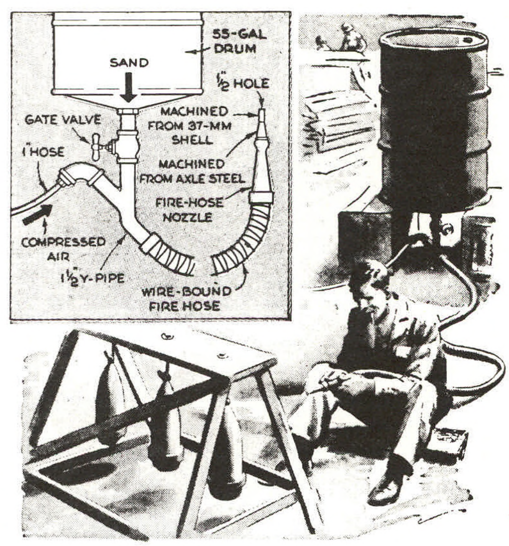


Side Outlet Tee Forms Head of Lead Hammer

THE lead hammer illustrated will not become battered as rapidly as the usual type. It also will strike a more balanced blow, as the hang of the hammer is little disturbed by constant use, owing to the side wall reinforcement.



A 2-in. tee with a 1-in. side outlet is used; the handle consists of a piece of 1-in. pipe. A ring is set over the outer ends when pouring the lead so that there is a projection of lead about 1 in. on both sides.



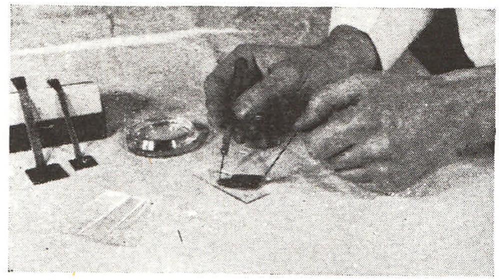
GI Ingenuity and Nazi Junk Pooled in Field Sandblast

The air compressor was borrowed from battalion headquarters, the wire-bound fire hose and nozzle were salvaged from an inactive fire station, and the oil drum and pipe fixtures were liberated from German military installations. The high-quality steel nozzle resists sand wear.

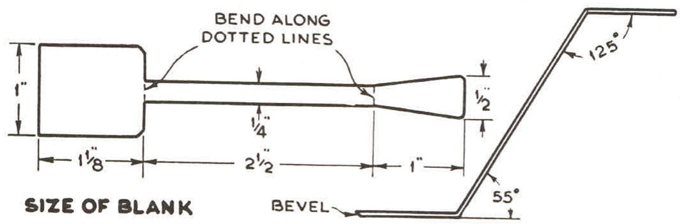
With the outfit on a trailer, one G.I. was sandblasting rust and old paint off a shipment of 155-mm. projectiles fast enough to keep a crew of POW's busy repainting and stenciling.—RICHARD M. RIEBLING.

Section Lifter Aids Microscopists in Handling Specimens

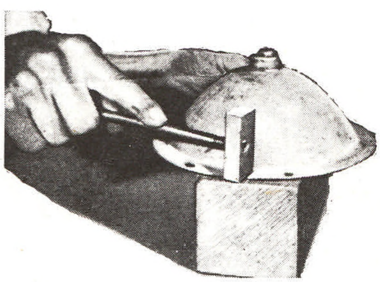
SPECIMENS prepared for microscopic examination are often so delicate that they may be damaged even by gentle handling with forceps. However, it is easy to make a section lifter, a simple little instrument which is used shovel-fashion and which will transfer specimens without harm onto a glass slide or from solution to solution.

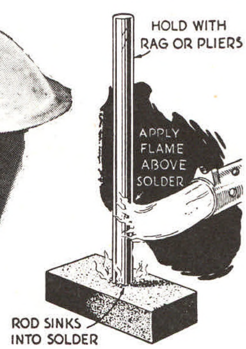


A section lifter may be cut from a sheet of 24-gauge copper, using the dimensions shown in the drawing at the right. After a blank has been cut, remove any burrs from it and file a bevel on the forward edge of the lifting surface. Then bend the piece to shape, and finish by cleaning thoroughly with a piece of fine emery cloth.—H. F. WHITTAKER.



Soft Hammer Made of Bar Solder



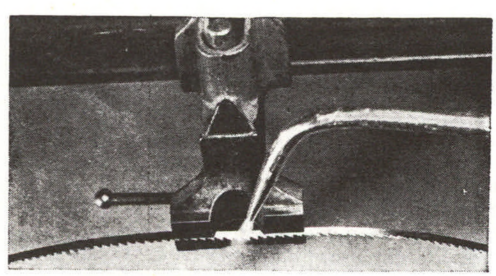


Right, the rod sinks into the solder when it is heated. Above, hammering out a kink in a polished surface

A USEFUL little soft hammer for removing kinks and dents in polished surfaces can be made in a few minutes from a 2″ length of ordinary bar solder and a 10″ metal rod. The handle may be attached by threading the rod end and tapping out a hole in the center of the solder or by applying heat from a blowtorch to the rod just above the solder and letting it sink slowly into the head, as shown. When the head has become badly battered, it may be removed and used as solder, and a new section supplied in its place.

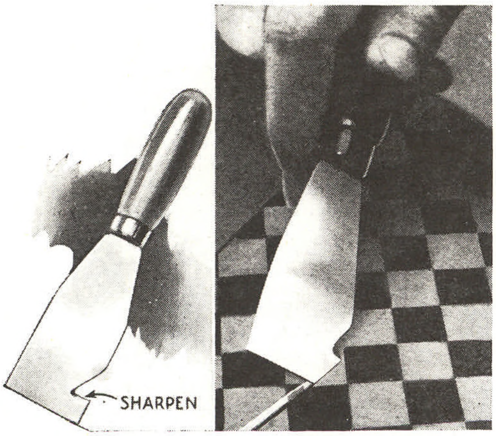
Vise Used to Clamp Band-Saw Blades in Position for Brazing

AN INEXPENSIVE small vise is easily converted into a clamp to hold band-saw blades in alignment for brazing. All that is necessary is to cut a semicircular notch in the middle of both jaws, as shown. A cutting torch can be used for this, or the notch can be ground, filed, or sawed. A good-quality hack-saw blade of the flexible-back type can be used to saw along the curve if it is narrowed by cutting off the back with tin snips. Mount vise with handle downward.

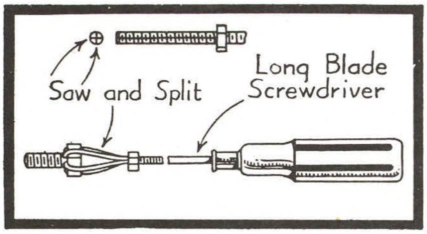


Linoleum Cutter Made from Putty Knife

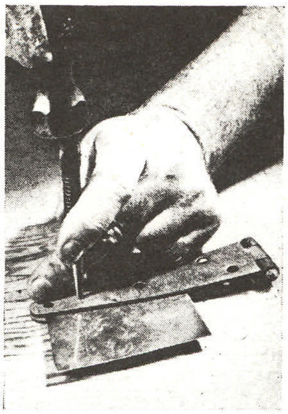
A LINOLEUM cutter can be made by cutting a notch near the end of a first-class putty knife. One edge of this notch is sharpened, and the knife is used as shown below. It has several advantages over an ordinary knife. Circles, squares, and other shapes can be cut as well as straight lines after you have had a little experience in manipulating the cutter.—WAYNE R. PIERCE.



The altered putty knife and method of using it. A sharp edge is necessary to cut a clean line



Holes Punched in Light Sheet Metal with Aid of Strap Hinge



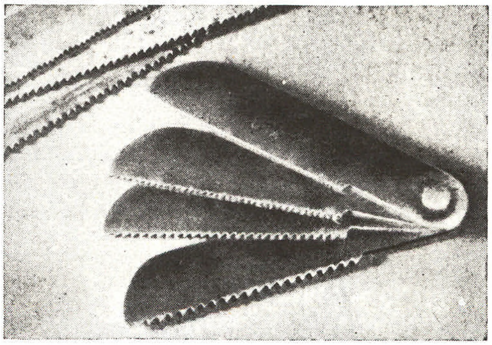
An ordinary strap hinge will serve as a die for punching small holes in thin copper, brass, or tin. The hinge pin should fit without play to keep the two leaves aligned

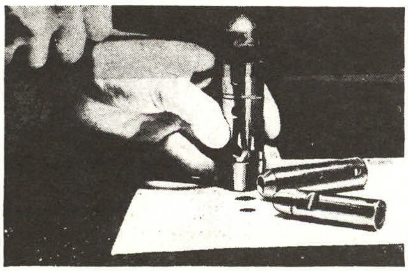
SMALL HOLES can be punched in lightweight sheet metal with the help of a common strap hinge. Bend one leaf of the hinge to close parallel with the other, and drill a hole of the required size through both. It may be necessary to bend the hinge pin to eliminate any play between the parts. Use either a pin punch or nail set ground to the size desired. When the holes in the hinge are worn too large to be of further service, it is a simple matter to drill new ones elsewhere.—E. A. BOWER.

Gauge for Hacksaw-Blade Teeth

UNLESS you are experienced enough to tell the number of teeth on a hacksaw blade at a glance, a gauge like that shown below will save you time. It is made from the ends of four broken hacksaw blades—one each of 14, 18, 24, and 32 teeth.

Grind off the side rake and rivet the pieces together with enough play to permit easy swing. Then grind to shape and remove the burrs.—WILL THOMAS.





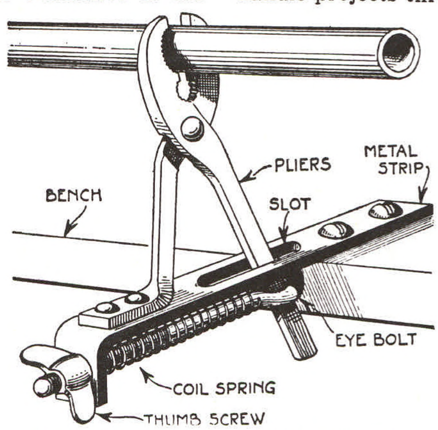
Punches Ground from Wrist Pins

HOLLOW punches suitable for punching paper, leather, gasket material, lead, and even thin sheet metal may be had in a wide variety of sizes by utilizing discarded wrist pins. Simply grind one end on a taper to a thin cutting edge. A wrist pin from an outboard motor, when ground, will cut a hole about ⅛" in diameter, while a pin from a large truck motor will often be 2" or better.—J. D.

Changing Pipe Tongs to a Small Pipe Vise

OLD pipe tongs and a few odds and ends are all the materials required for making a pipe vise that will render very efficient and satisfactory service in holding pipe and rod of all sizes within its capacity. Should the joint of the tongs be worn and loose, it will add to the excellence of the finished tool if it is tightened, which is best done by taking out the old rivet and putting in a new one, after redrilling or reaming the holes. The dimensions of the parts will depend upon the size of the tongs used.

For the base use a plate of cold-rolled steel about 3/16 in. thick; a thinner plate is apt to make the vise too springy. Rivet one handle of the tongs to the plate with rivets as large as can be used without too much weakening of the handle. To do this the handle must be heated, flattened somewhat, and bent as shown in the illustration. Keep a wet rag around the jaws to prevent the temper from being drawn while heating. The other handle projects through a slot in the plate.



An extremely useful addition to the workbench of any workshop where pipes and rods are frequently handled

Heat the plate and bend it as shown, at right angles, and drill it for an eye-bolt to pass through easily. The eye of the bolt is slipped on the projecting handle and a thumb-nut is put on the thread. A spiral spring on the bolt will keep the vise at as wide an opening as the position of the thumb-nut permits.

Leave the plate long enough to be screwed either to the edge of the bench or to a block.

Fit Up Your Workbench with Lathe, Saw, and Drill

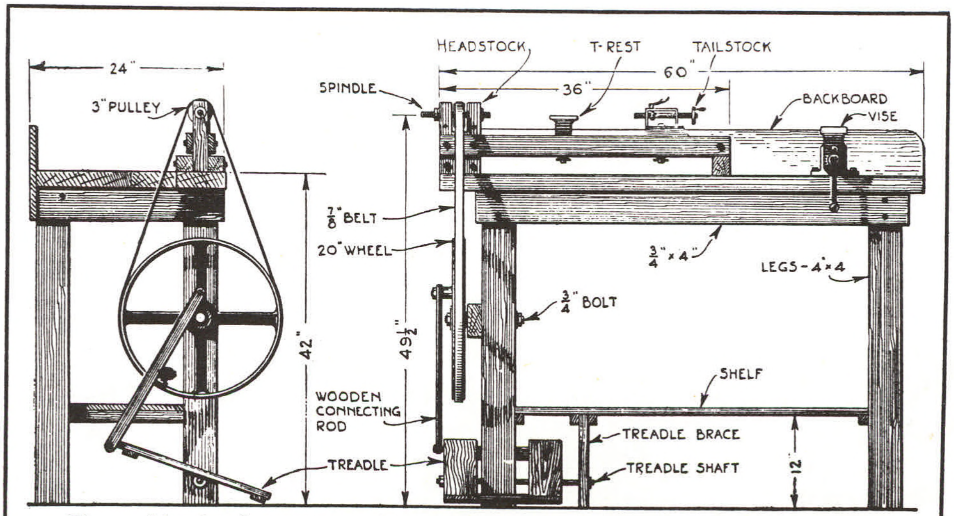
By Joe V. Romig

THE first requisite of the home workshop is a good sturdy workbench fitted with a neat and serviceable vise. Add to these a few simple tools and immediately it becomes possible to build more equipment—a small lathe for wood-turning, a grinder for sharpening tools, a drill press and other machines. Each of these individual tools, however, takes up space and, if purchased, costs considerable money. An additional outlay is also involved on account of the necessity of buying a motor. Because of the cost and since the space allotted to the home workshop is usually small, many amateur mechanics abandon the idea of using machines at all, and content themselves with hand tools.

The happy solution of the problem lies in the combination of a workbench and a lathe with detachable shears. The lathe head, of course, can also be used for other purposes, such as drilling, buffing, grinding, sanding, and sawing. The machine can be operated most conveniently and economically by a simple treadle device fastened to the left front leg of the workbench.

The lathe, as shown in the accompanying illustrations, has a swing of 5 in. in diameter and takes work up to 26 in. between centers; it will run an 8-in. saw and pull a 10-in. disk grinder. Handfeed drilling is accomplished by using a small drill chuck in the headstock spindle and a drillpad on the tail screw. The power available is ample to drill up to ⅜-in. thick steel.

The detachable shears can be dismounted from the lathe by removing the two ½-in. bolts that clamp them to the bench. When removed, they can be placed on the shelf below, out of the way, but close at hand.



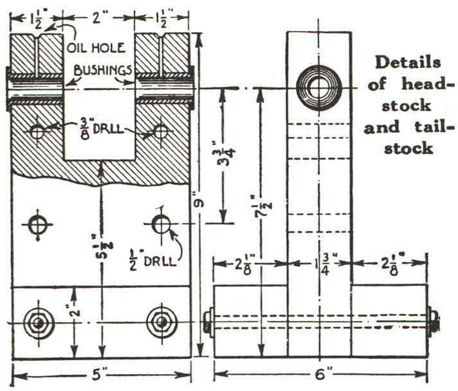
The combination footpower machine can be removed and placed on the shelf when it is desired to use the bench

In constructing the outfit, build the workbench first, using 2-in. dressed lumber for the top, preferably oak or maple. The front board is longer than the one or two rear boards, as it carries the machine head. Good solid legs of 4 by 4 in. stock are used and an apron of ⅞-in. boards runs all around the bench top. Cross pieces are screwed to the legs to receive the shelf, which stiffens the whole structure. A wide board is also fastened to the rear of the bench to form the backboard. Use

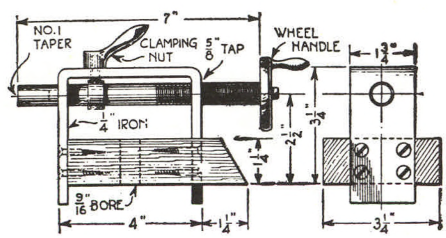
Continued

long wood screws in place of nails to fasten the whole bench together.

The head for the machine equipment is made of hard wood, as shown. Holes are drilled through it and fitted with brass bushings, in which the spindle runs. The



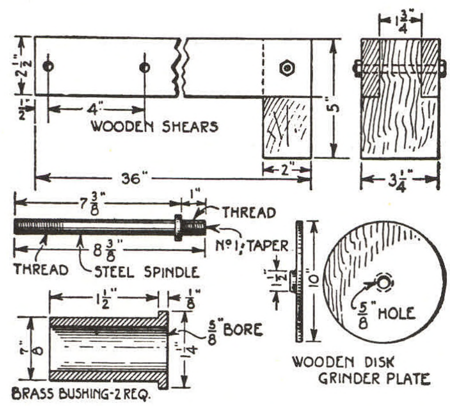
Details of headstock and tailstock



spindle, threaded at each end, is of steel. The long thread is for carrying the grinding wheels, the disk grinder, and buffing wheels, and the short front thread is for the faceplates and chucks. A 3-in. pulley is fastened with screws to the spindle between the two bearings. The base for the head is made by bolting two pieces of wood against its sides with long bolts. All the woodwork should be planed square.

The construction of the tailstock is novel and simple. A piece of flat iron is bent in the blacksmith shop to the dimensions indicated and is then fastened to the flat wooden block with wood screws. The block is mortised to receive this iron piece, and the projection of the iron between the shears at both ends keeps the tailstock in perfect alinement with the headstock at all times. A 1/2-in. bolt, nut, and washer are used to clamp it down on the shears.

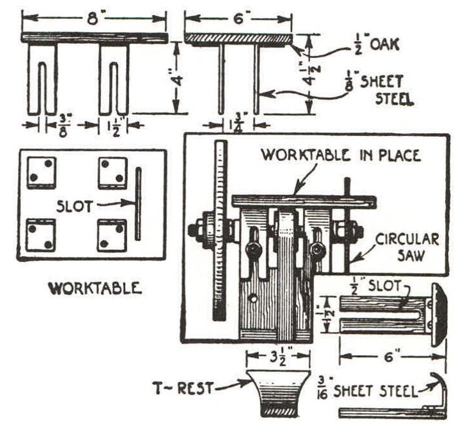
The T-rest is made of steel and wood as shown, a slotted piece of wood being used



The wooden shears or lathe bed, headstock spindle, T-rest, worktable, and other details

for a base. This rest can be moved in and out or swung at any desired angle.

The shears are made of hard wood, carefully dressed straight and true. The pieces are 3/4 by 2 1/2 in. by 3 ft. The tail end is clamped with one 3/8-in. bolt to a rest block or shor leg. The front end is slipped over the headstock and is clamped in place with through bolts 1/2 in. in diameter. The driving wheel in this instance is from an old washing machine. A similar wheel can be picked up in any junkyard for a few cents. The treadle is made as shown and mounted on a long bolt, which forms the treadle shaft. A two-board treadle will



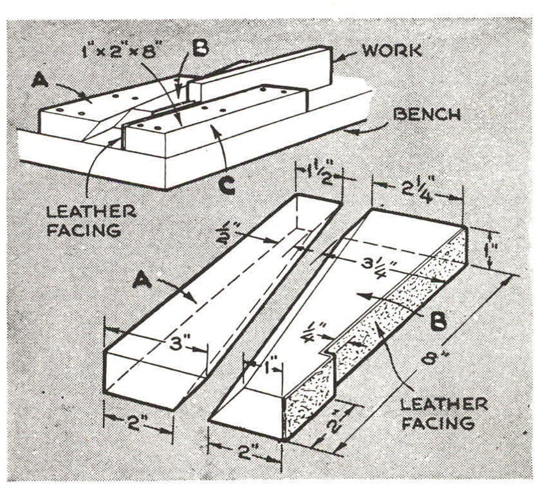
suffice for this machine, as the lathe is short and work can be done without difficulty as far to the right as the tailstock will go. A wooden connecting rod couples the treadle and the wheel, and a 7/8-in. leather belt drives the pulley.

The method for making the worktable to be used in connection with the saw is clearly shown in the detail drawing. The angle braces are of sheet steel screwed to the bottom of the table and have slots that slip over two 3/8-in. bolts, which run through the headstock and clamp the braces tightly to the sides of the head. For draft work on patterns, the table can be slanted to suit requirements.

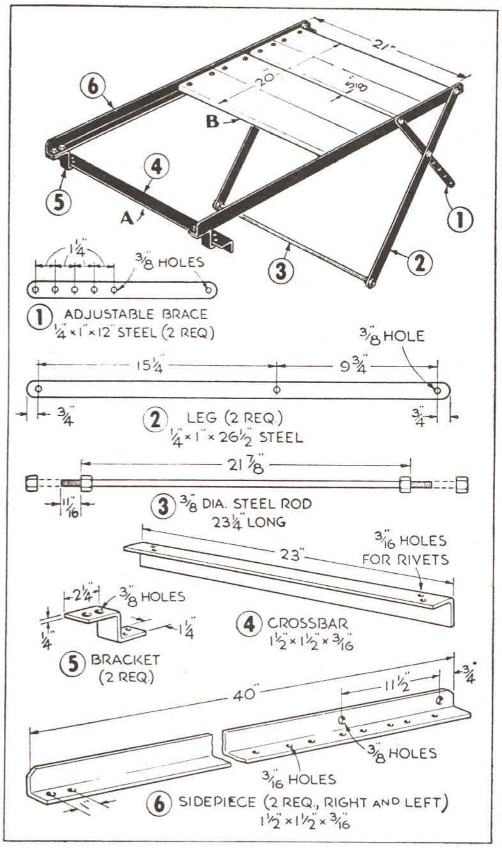
A small 2 or 3 in. scroll chuck mounted on a faceplate will be found a valuable addition on many small jobs of turning up brass and fiber, polishing, and the like.

Useful Bench Clamp Is Made From Hardwood and Scrap Material

THIS bench clamp is simple to make and easy to use. Since it is mounted on the bench top, work can be uniformly supported throughout its length. Thus in some cases it is better to use the clamp than a conventional vise, which allows the ends of long work to sag. A notch in the wedge is for clamping material more than 1" thick. The wedge and one of the stationary pieces are faced with leather, as indicated, to prevent marring delicate work. Make the three pieces from hardwood, taking particular care when cutting the bevel. Fasten the wedge to the bench with a leather thong so it won't be misplaced and firmly secure the other two pieces in place with flathead, countersunk wood screws. Try several locations before mounting the clamp.—F. LYTKEN.



Adjustable Platform for Painting and Cleaning Windows



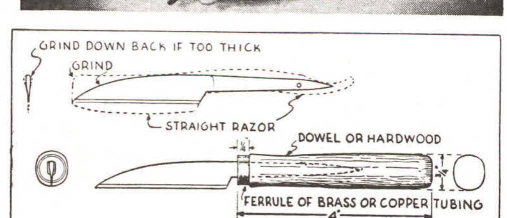
Anchored to the window ledge, this platform of steel and hardwood provides safety for workmen

WINDOW painting and cleaning platforms of the type illustrated have proved their value at Concordia Teachers College, Seward, Nebr., where they have been used on nine buildings for the past seven years.

The framework is of steel fastened with 3/8" bolts, and platform *B* is of hardwood fastened to the sidepieces with 3/16" roundhead stove bolts. The crossbar marked *A* hooks under the projecting ledge of the window sill on the inside of the building. Piece *A* is riveted to the brackets with 3/16" rivets. It is important that the legs, marked No. 2, rest firmly against the outside wall. A guard rail could, of course, be added if thought necessary.—RUDOLPH BERNING.

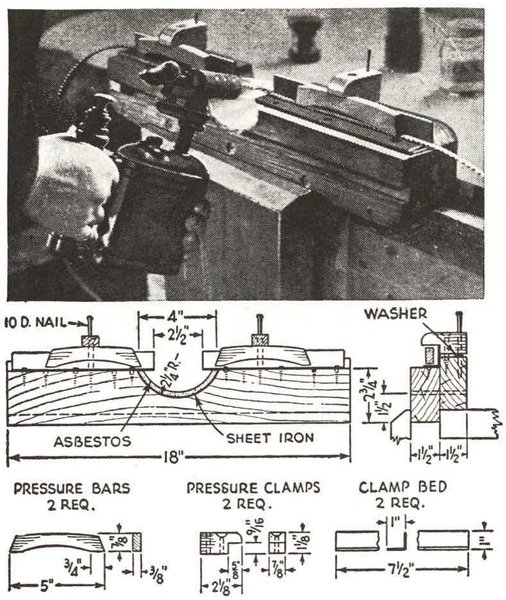
Discarded Razor Transformed into Keen Whittling Knife

A WHITTLING knife that will hold an exceptionally keen edge can be made from an old straight razor. Since the original shaving edge is too thin for its new role, it should be ground back about 1/4". Do not remove more than is necessary to thicken the edge slightly, because many razors are tempered only part way back from the edge. Take care not to "burn" the steel. Grind the entire blade to the shape shown in the drawing at the right, reducing the thickness at the back if desired. Use hardwood or a piece of 3/4" birch dowel for the handle and attach a ferrule of seamless brass or copper tubing. If such tubing is unavailable, a discarded kitchen fork or spoon will probably yield a ferrule. Restore the knife edge to razor sharpness on an oilstone and make a leather or wooden sheath to fit the blade, as shown in the photograph.—C. W. B.

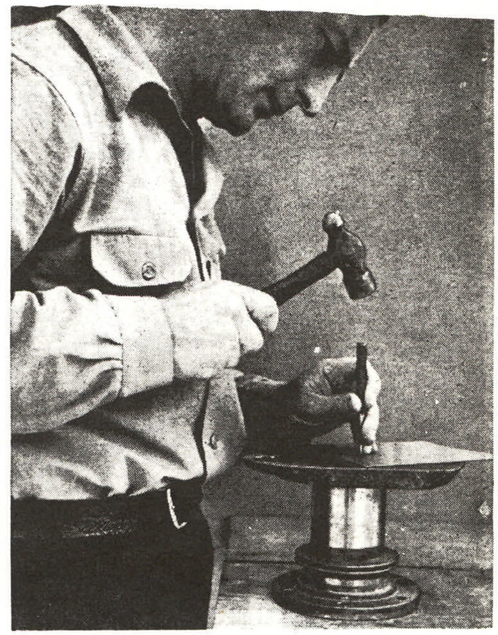


Easily Improvised Clamp Holds Band Saw for Brazing

THE inconvenience and delay of sending a broken band-saw blade away for brazing may be avoided by making a clamp as shown below and doing the brazing yourself. Line the circle in the center of the block with sheet iron and asbestos paper to protect the wood. The brazing is done in the usual way, except that with a homemade clamp of this type it is necessary to wind the joint tightly with fine, soft iron wire and push a small brad under the top wires to hold the tapered ends in contact.



The center of the block is lined with sheet iron and asbestos paper to protect the wood from heat



Part of Discarded Crankshaft Serves as a Bench Anvil

MOST types of broken or worn-out automobile or truck crankshafts can be converted into convenient bench anvils with little trouble. With a cutting torch or power saw, cut the flywheel end of the shaft off at the first crank, and dress the cut smooth on an emery wheel or with a file. The flange forms a solid base for fastening the anvil to the workbench.—CHARLES H. HARDY.

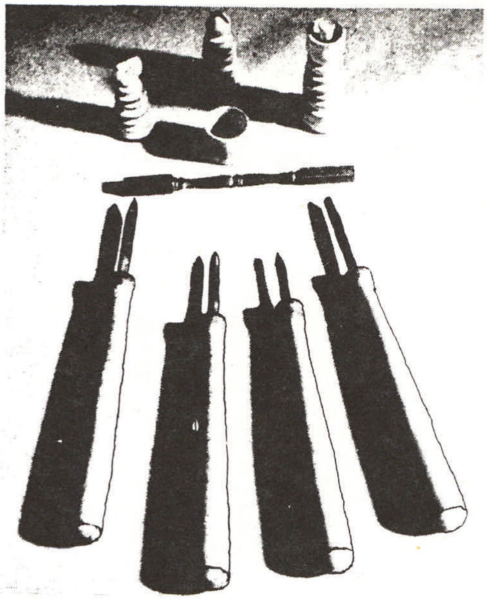
Jig for Trimming Ends of Furniture Squares

Uniform bevels can be cut at any desired angle

CONSTRUCTED from scraps, the device shown is used for beveling or chamfering the ends of pieces of softwood for handmade furniture. The base is a piece of 2" by 4" about 15" long. The adjustable frame is of ¾" oak with two steel straps across the top to hold the chisel. Slotted box-lid supports provide for adjustment to different angles. A piece of hardwood with slotted screw holes serves as an adjustable stop for the work.

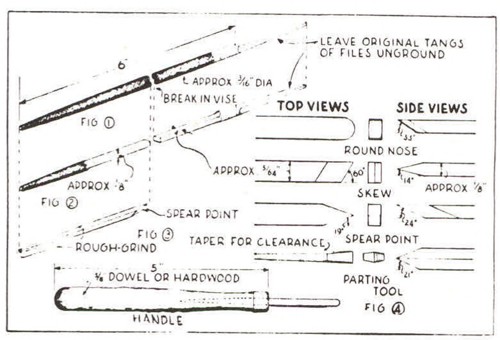
Tool steel, 9" by 1" by ¼", was used in making the chisel. The cutting end was ground to a 22-deg. angle, then hardened, tempered, and sharpened to a keen edge on an oilstone.—J. C. MONTGOMERY.

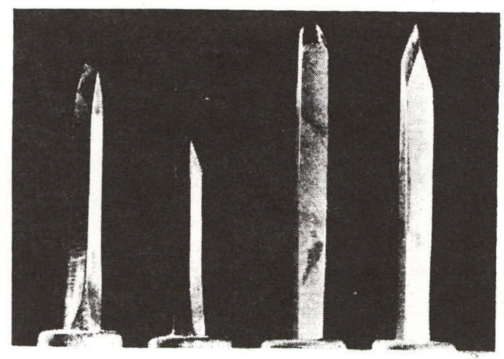
Model Maker's Turning Tools Are Ground from Small Files



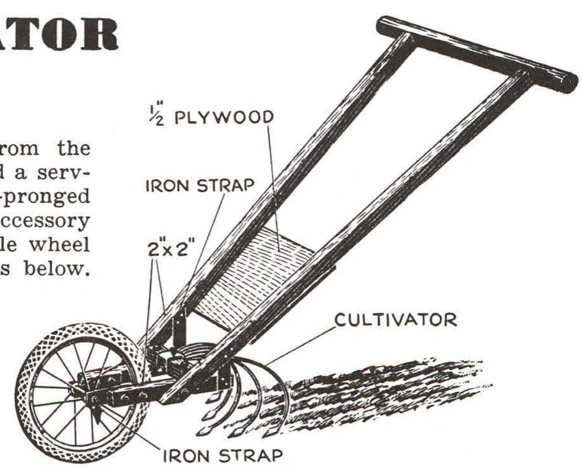
FOUR excellent wood-turning tools, especially suited for model making and other small-scale lathe work, can be ground from two worn-out 6" round files. Break the files in a vise so that the pieces are of about equal length (Fig. 1) and grind them until they are rectangular in shape as shown in Fig. 2. The pointed ends need only be rough-ground (Fig. 3) since they will fit within the handles, but the exposed portions should have all file marks removed. Be sure that the surfaces which will bear on the lathe rest are ground smooth.

The cutting points should be shaped with particular care to secure the angles shown in Fig. 4; use a grinding jig if one is available. Handles can be made from ⅝" birch or maple dowel. Ferrules are not necessary if the handles are drilled out sufficiently before the tools are forced in. Finish the cutting edges on an oilstone to razor keenness. If you wish to make a set of larger tools, pillar files will need less grinding than larger round files.—C. W. BERTSCH.





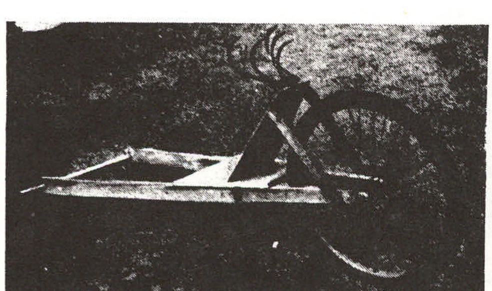
WHEEL CULTIVATOR

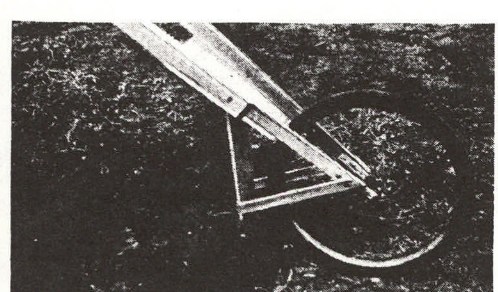


Dimensions depend on the size of the wheel, but the handle should come to about elbow height. Use bolts and nuts throughout in assembling the parts

WHEEL cultivators are disappearing from the market, but the Victory gardener can build a serviceable one from simple materials. The five-pronged tool can either be bought as a wheel-hoe accessory or taken from a hand cultivator. A bicycle wheel was used for the implement in the photos below. Panels of ½" plywood join the frame members and support the tool rigidly.

A smaller wheel, such as one from a discarded tricycle, should be used in the alternative design shown in the drawing. This has the advantage that force is applied in a direct line to the cultivator prongs. Assemble all parts with bolts and nuts. Strap-iron extensions support the axle. Two braces make a rigid unit of the handle members and the lower frame.



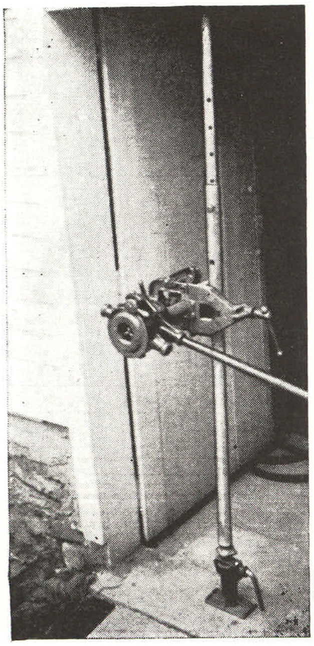


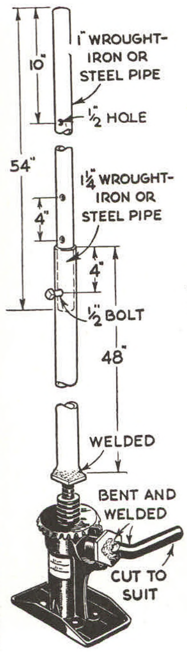
Easily Built Telescoping Support Has Numerous Uses

WITH a 48″ length of $1\frac{1}{4}$″ pipe, a 54″ length of 1″ pipe, and an old automobile jack, preferably of the screw type, you can construct an adjustable support that will give valuable service around the shop and home. It will support a pipe vise for threading pipe, hold long lumber being cut on a circular saw, keep sheet metal or wallboard against the ceiling while one is nailing it on, serve as an auxiliary clothesline pole, and so forth.

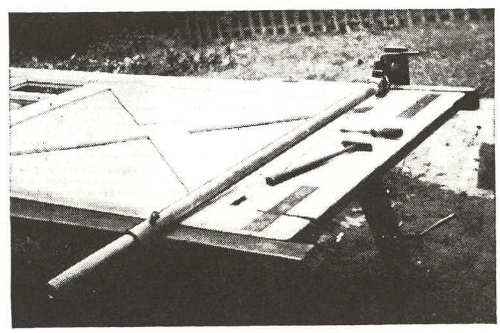
Drill a ½″ hole 4″ from the end of the $1\frac{1}{4}$″ pipe. Drill ½″ holes 4″ apart in the 1″ pipe, starting 10″ from one end. The smaller pipe, inside the larger one, protrudes 6″ to afford a grip for adjusting the setup. A ½″ bolt will serve to hold the pipes at approximately the setting desired, and the jack screw will take up the slack.

Weld the $1\frac{1}{4}$″ pipe solidly to the top of the jack. Bend the handle near the jack at a right angle and cut the other end off to suit. This adjustable support, with a piece of angle iron bolted to the smaller pipe at the desired hole, will serve also as a carpenter's clamp, as shown in the photo directly below.—URIAH HILLEGAS.

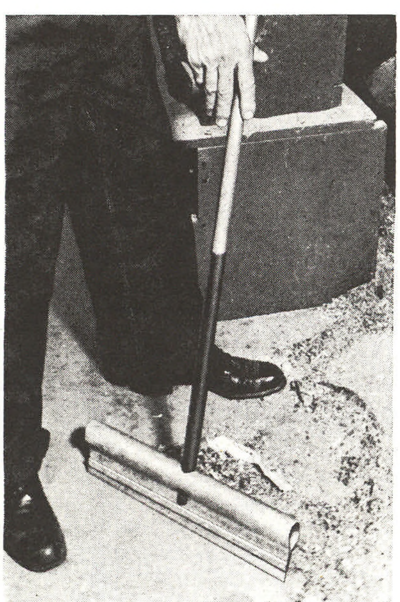


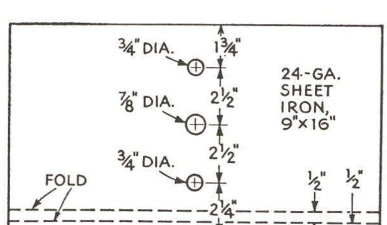


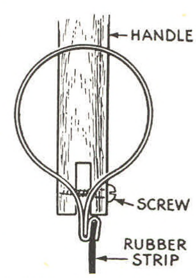
At left, how the support, set up in a doorway or in a cellar between floor and joist, will hold a pipe vise



Efficient Squeegee Sweeper Keeps Workshop Floor Clean







The unfolded edge is securely locked behind the other. Sharp punch indentations help to hold the rubber strip

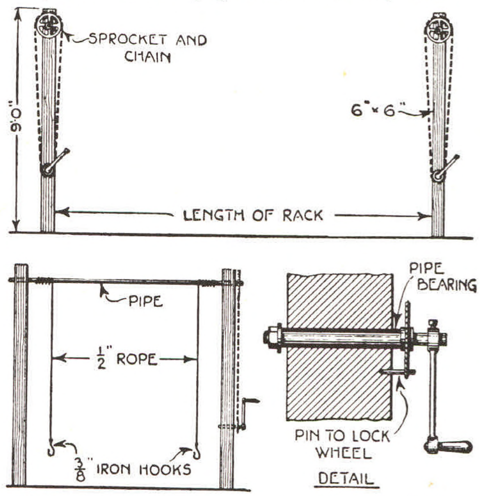
THIS squeegee will be found excellent for sweeping up shavings and other workshop litter or spreading spilled liquids so that floors will dry more readily. A piece of 24-gauge galvanized iron is drilled and bent as shown, one edge being folded twice along the dotted lines and squeezed shut over a strip of heavy sheet-rubber packing. Make punch marks along one edge to further secure the rubber. On a disk or drum sander bevel the strip to a thin, flexible edge. Slot one end of an old broom or mop handle, insert so that the folded edge of the metal engages the slot, and fasten with a single screw.—BENJAMIN NIELSEN.

How to Build a Hoist for the Hayrack

ONE of the few things that are done still in the old way about the average farm is unloading heavy hayracks by hand. As often as the wagon gear is changed from the wagon box to the hayrack and back again, backaches and strained muscles are in evidence, for the shifting of a hayrack of modern dimensions is no one-man task. After being laid up in bed for a week with lumbago, which was brought on by putting on a hayrack single handed, a farmer erected a hayrack hoist after the manner of the one shown in the illustration. No matter how many times the rack has to come off and go on again, it is a simple task to do the work.

Necessary parts were procured from an old-time binder that had long since sought the scrap-heap. Four 6 by 6 in. posts were set into the ground a distance of 4 ft., each spaced similarly to the corners of the rack. The length of the hoist is the length of the rack, while its width is the width of the rack plus 1 ft. These posts were cut long enough to enable the rack to be driven under without interference for unloading. Two gas-pipes 1½ in. in diameter were cut 6 in. longer than the outside distance of the ends of the hoist, with holes bored a few inches from the tops of the posts to accommodate them. Small holes were drilled in each end of the pipes, so that when in place, bolts could be put through on each side of the post to keep them from working out.

Two sprocket wheels, each of the same size, taken from the binder when keyed to the pipes as shown, com-



With this hoist, the construction of which is shown in detail, two men, or even one, can lift a heavy hayrack off the truck

pleted the top of the hoist. The manner in which the cranks and lower sprockets were arranged is shown in the detail. Holes were bored through the posts at a convenient height, and 7-in. lengths of gas-pipe were driven in to a wedge fit. The handles were bent from a rod just large enough to fit the pipe bearings nicely and were threaded on the inside end as shown. The smaller sprocket wheels, when keyed to these shafts, and the nuts put on to keep the handles from working out, finished the hoist. An ample supply of chain to fit the two mechanisms was found on the binder.

To use this hoist, 4 lengths of ½-in. rope were required. One end of each was run through a hole drilled through the pipe for the purpose, and hooks were tied to the lower ends so that they were of the same height.

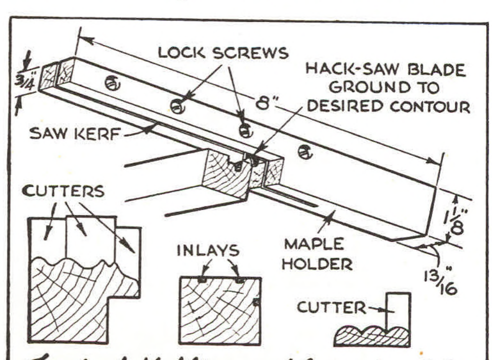
In unloading the rack, the wagon is driven between the side posts, and the cranks turned until the hooks are on a level with the cross-bed piece of the rack at the front and back. The hooks are then slipped under these pieces, and the cranks operated one at a time, if need be, until the rack has been raised clear of the running gear of the wagon. If this is done alone, it will be necessary to turn one crank and then the other alternately, in order not to cause any binding between the standards.

How was the rack kept raised? A hole was bored into each crank-post between spokes of the smaller sprocket wheel, and an iron pin slipped in after the rack had been raised.

It will be noticed that this device prevents any swaying by the wind, as all four corners of the rack are supported, and if the rack is raised so that the top is above the gas-pipes, there will be no play forward and backward.—DALE R. VAN HORN.

Hack-Saw Blade Serves as Cutter in Simple Hand Molder

THE home craftsman who has no power shaper may still make moldings by using an old hack-saw blade for the job. Grind the blade to the desired shape and carefully sharpen the edges. In a stepped handle bore a set of holes and saw across them to provide a slot for holding the blade. Insert the shaped cutter and tighten it in place with small bolts and nuts. By using the inside shoulder of the handle as a guide, the cutter can be drawn across the surface of the molding for forming the corresponding contours. A number of cutters of different shapes can be ground as need arises, and as many may be inserted in the holder at a time as are required.—R. E. DAVIS.



Typical Molding and Grooving Jobs

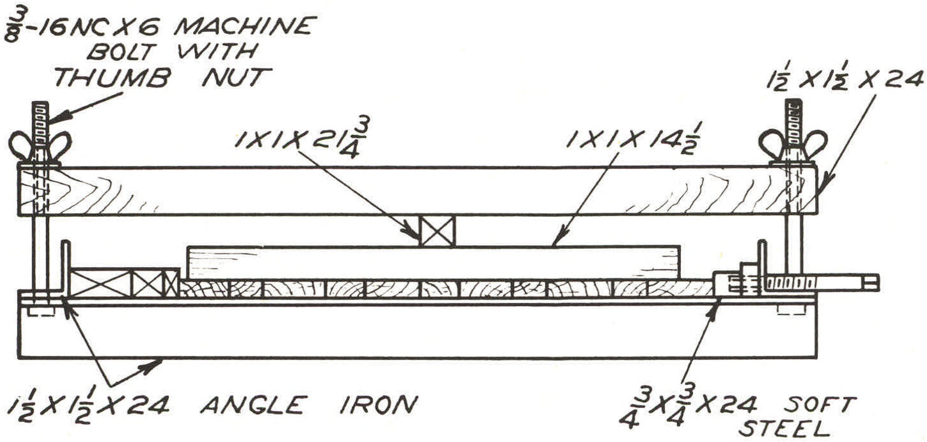
HANDY CLAMP

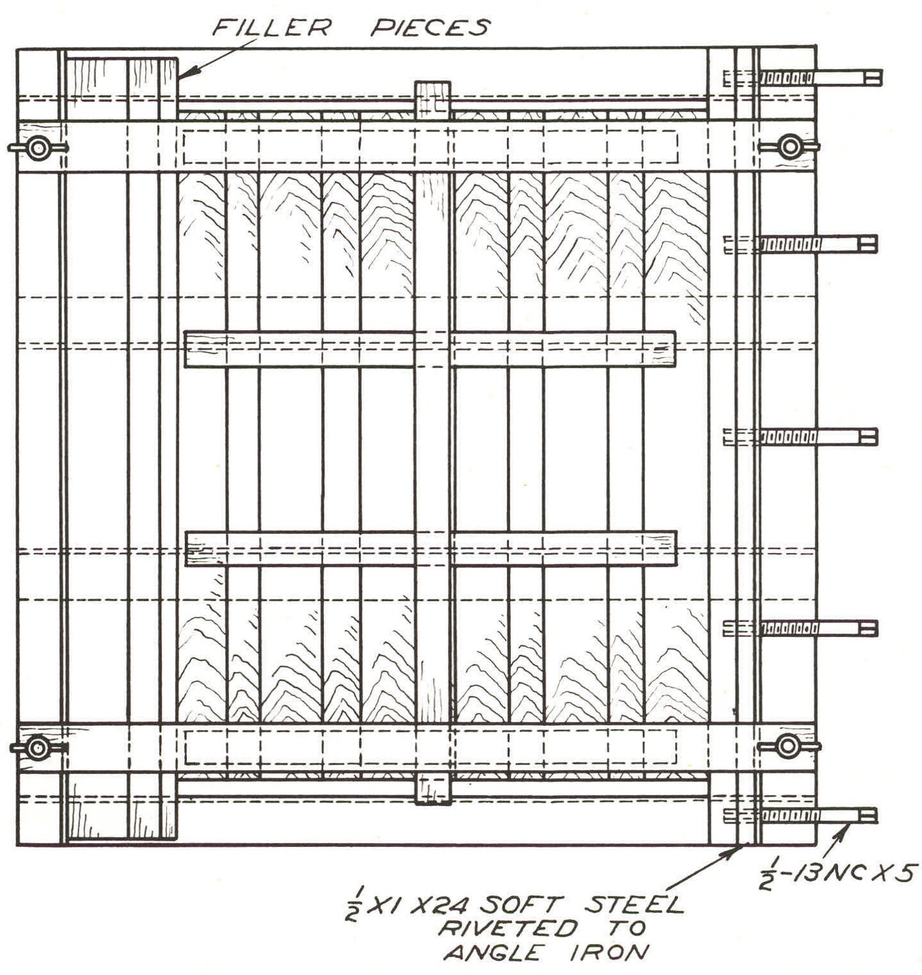
WILLIAM E. CASWELL

Manfield, Pa.

This clamp is a very convenient accessory in a general shop. It is used when gluing up small stock for serving trays, checkerboards, cutting boards, and small table tops. The vertical pressure bars prevent thin material from buckling.

The size of the clamp may be varied. The one shown is made of 6 pieces of 1½ by 1½ by 24-in. angle iron. Filler pieces of various widths are used to reduce the capacity of the clamp for narrow work.

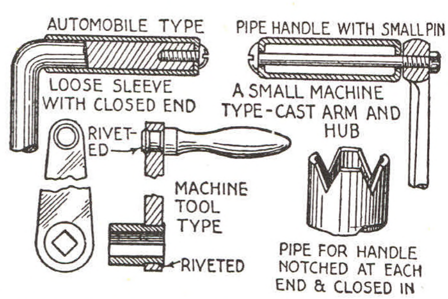




How to Make Simple Cranks and Crank Handles

MANY automobile cranks are bent from round steel stock and fitted with a pin for engaging the notches in the fan pulley of the engine. These cranks usually have a plain hand grip, so that one is apt to get blisters when spinning the motor for any length of time. To overcome this, the writer has fitted his own crank, as well as those of his motoring friends, with loose sleeves, as shown.

The sleeve is a length of thin brass tubing. Notches are sawed in one end of the tube and the prongs are bent to leave an opening that is filed out to fit loosely over a bottomed screw with a large head. When the wooden handle of the corn sheller, the washing machine, or any other



Three easily constructed crank handles for automobile or machine use

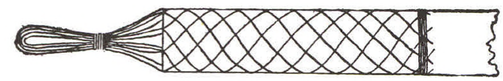
small hand-operated machine splits or breaks, it can be replaced in a somewhat similar manner with a pipe sleeve handle. A short section of pipe is notched at each end, as shown, and these ends are then closed in, leaving a hole for the through bolt that forms the spindle of the crank. Handles of this type have a good grip and will outwear the rest of the machine. They should be oiled occasionally.

Machine tool cranks, if lost, can be replaced with neat, rugged cranks built of flat and round steel, as illustrated. A long tapered arm or crank web is fitted at its upper end with a handle turned to shape and riveted in place.

The hub or the eye is also turned up out of round steel and has a shoulder that fits against the web. The end of the hub that projects through the bore of the web is riveted over to hold the parts firmly together.—L. F. C.

A Love Knot Cable Puller

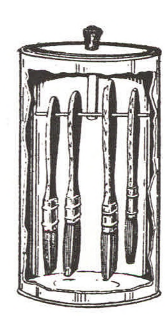
Many times it is necessary to pull wires or ropes or cables through a pipe or conduit whose interior diameter is not large enough to allow for any way to fasten the pulling wire. A handy contrivance for overcoming this difficulty is the adaptation of the old fa-

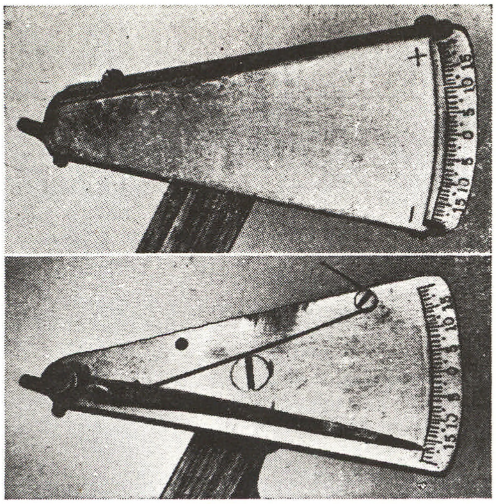


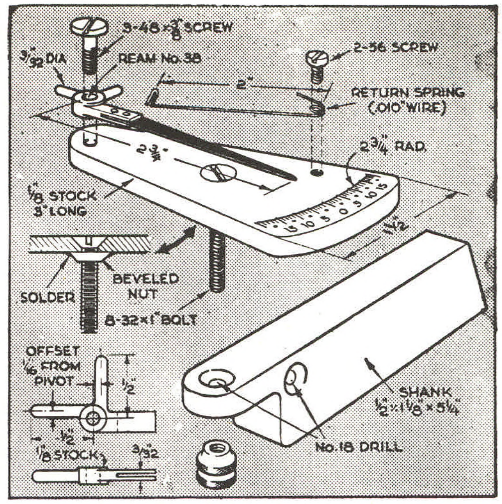
Love Knot Grip

miliar "love knots." Many of us have placed our fingers in the ends of these love knots with ease and then found to our surprise that we could not get them out quite so easily.

To make this device take several wires, which will depend upon conditions, and double them at the middle so as to form a loop. Wrap them at this point to keep the ends in good shape and then proceed to weave them around the end of the cable or something of approximately the same diameter. The sketch shows the method. It is not necessary to weave the ends closely; in fact, it is better to leave considerable space between the separate wires, as the puller will better adapt itself to the different sized cables or ropes. After weaving far enough for each strand to encircle the cable several times, the ends may be held down by means of a string, rubber band or any other convenient means. If the loop is now pulled, it will be found that the love knot clings tightly to the cable and the harder the pull, the tighter the grip. If the knot is pushed from the end opposite the loop it may be slipped off the cable with ease. The same knot will fit cables having varying diameters. The flexible wire used ordinarily for hanging pictures will be found convenient for making medium sized pullers.—M. R. W.





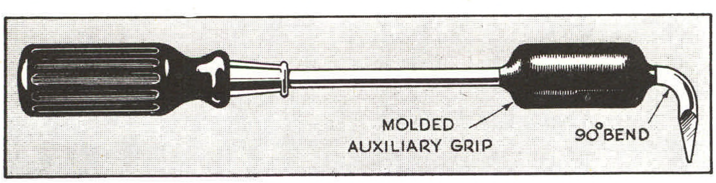


Sensitive Shopmade Indicator Reads Thousandths

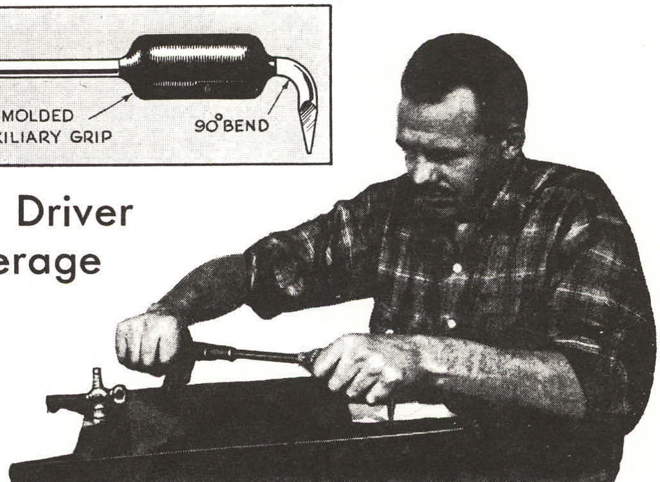
REQUIRING no gears or critical machining, this indicator has a range of over .015" plus or minus and can be set up two ways.

Shape the base plate of 1/8" cold-rolled steel, clamp the mounting bolt to it with a beveled nut, and secure with solder. Use hardenable steel for the pivot lever, laying out the offsets carefully; these are the centerlines of the ball tips, which should be smooth and polished. Ream the hole a close fit on the pin. Harden all over; then draw to straw color. Solder a bit of jeweler's saw blade in the slot as a pointer.

The spring makes a single loop about its anchor screw, and has a short end that bears against the case. Use a lock nut beneath so the screw doesn't clamp the loop. A cover can be bent from sheet metal. It might be held by prick-punching four spots into dimples in the plate instead of with screws as in the original. The shank is of soft steel, with two mounting holes for the indicator. Set it up to bear against work along the offset line, so that this 1/16" offset is the short side of the multiplying lever. With the cross-feed collar of the lathe, index and lightly punch the graduations. Scratch them as lines radiating from the pivot.—JOHN A. BLAKER.



Heavy-Duty Screw Driver Gives Great Leverage



A HEAVY-DUTY "persuader" for stubborn screws can be fashioned from a large screw driver. An inch or so from the tip, apply a narrow blowtorch flame and heat the shank for a few moments. Do not permit it to get so hot that the temper of the whole tool will be drawn. This heating is merely to allow the tip to be placed in a vise and bent to a 90-deg. angle.

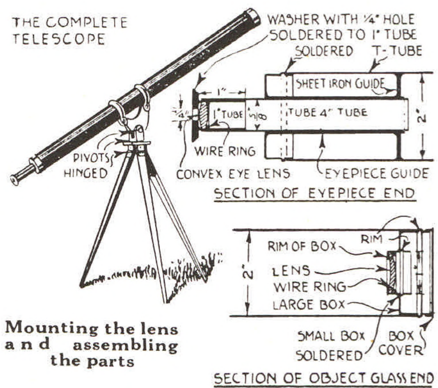
The auxiliary grip is molded from a composition formed by heating half a cup of thin glue, then adding tissue paper until a thick paste results, after which chalk (whiting) is added until the mixture is a stiff dough. In three or four days this will dry hard and can be sanded or carved to provide a smooth grip.—K.F.K.

How to Make a Small Telescope

By Jule W. Dennis

THE telescope described in this article was made by the writer and has been used in studying the moon and the planets.

First obtain a common spectacle lens of 4 or 5 ft. focal length. It should be one of the old flat type which has much better defining power than the new greatly curved type of lens. The focal length is easily found by holding the lens in the sun and measuring the distance from the lens to the point where the light comes to a small clear circle. Also secure a small double convex lens such as is used in the view-finder of a camera.



Mounting the lens and assembling the parts

Have a tinner make a sheet-iron tube, 2 in. in diameter and 3 in. shorter than the focal length of the spectacle lens, or object glass. A section of good 2-in. rain-water drainpipe could be used for this purpose.

From a drug-store buy two 1-oz. salve-boxes; these will fit snugly in the tube. Get a smaller salve-box about 1 in. in diameter and grind the object glass on a grindstone to fit inside it. Cut the bottom out of the small box, leaving only a small ring on which to seat the lens. Cut a hole in one of the large boxes just large enough so that the small box will fit into it. Solder the small box into the large one and then solder them both into one end of the telescope tube, with the bottom of the box inside. Seat the object glass in the small box, using a piece of round spring wire to hold it in place.

Take the other large box and cut a round hole in the center of it, ⅝ in. in diameter. Cut a round piece of heavy sheet iron to fit tightly inside the telescope tube at right angles and bore a ⅝-in. hole in the center of it.

Make a round tube of tin 3 in. long and ⅝ in. outside diameter. Solder one end into the salve-box and the other into the round piece of sheet iron. Push the whole into the telescope tube, sheet-iron guide first, until the box is flush with the end; then solder firmly. This will form the guide in which the eyepiece tube slides.

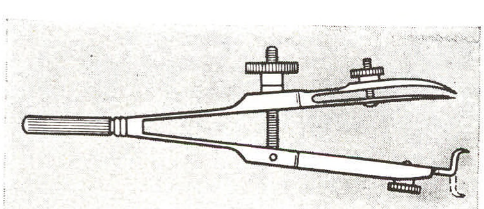
Two more tin tubes are needed, one 4 in. long, which will slide easily in the eyepiece guide, and a tube 1 in. long, which must fit tightly in the 4-in. tube. Solder a round piece of sheet iron or a washer to one end of the 1-in. tube. This washer should have a ¼-in. hole in it.

Now seat your eye lens against the washer and fasten it in place with a piece of spring wire, like the object glass. Push the 1-in. tube into the 4-in. tube, and the whole into the guide.

Before the telescope is used, it should be blackened inside with lampblack or liquid stove-polish to prevent reflections. The tube will look much better if covered on the outside with imitation leather. The telescope may be mounted on a tripod, if desired.

To ascertain the magnifying power, divide the focal length of the object glass by the focal length of the eyeglass, the result being the magnifying power. For the writer's 5-ft. telescope the magnifying power is 80 diameters.

To focus on the moon or other object, slide the eye tube in and out until the image is clearly defined.



SMALL CIRCLES can be drawn with precision by using a sewing needle bent as shown at the left in a bow pen. The needle should be heated to a cherry red and allowed to cool gradually before bending. With this, a circle can be drawn which is scarcely larger than the point. By reversing, the needle, as dotted lines show, you can draw extra large circles.—SAMUEL T. TILTON.

A Jig for Bending S-Hooks into Links for Special Chains

S-HOOKS can be made in the vise and assembled into chains for suspending porch and lawn swings and for other purposes for which manufactured chains are not immediately available.

The jig illustrated was made for bending S-hooks from stock ⅛" to ⅜" in diameter and either 8½" or 10½" long. Electrodes used by electric welders form hooks of sufficient strength for a porch swing and similar purposes.

Take a piece of ½" by 2½" by 8" flat stock as shown in Fig. 1, and drill and tap it from the underside to take three ¾" by 4" nipples, *A, B,* and *C*. Then make two handles as shown in Fig. 2. The pin *D* is simply a ¾" bolt 1 9/16" long under the head, with the head machined round and to a thickness of ¼". A ¾" nipple *E*, 1" long, is slipped over bolt *D* before screwing it into the handle; it serves as a roller when bending the stock. Pin *F* is a piece of ¾" by 5 5/16" round stock, threaded on one end for a distance of 1 13/16", and is screwed into the handle from the underside so that it extends above it 1 5/16". A ¾" by 1" pipe nipple *G* is slipped over the threaded portion of *F*; a ¾" nut *H* holds it in position. This nut is machined round and to a thickness of ¼".

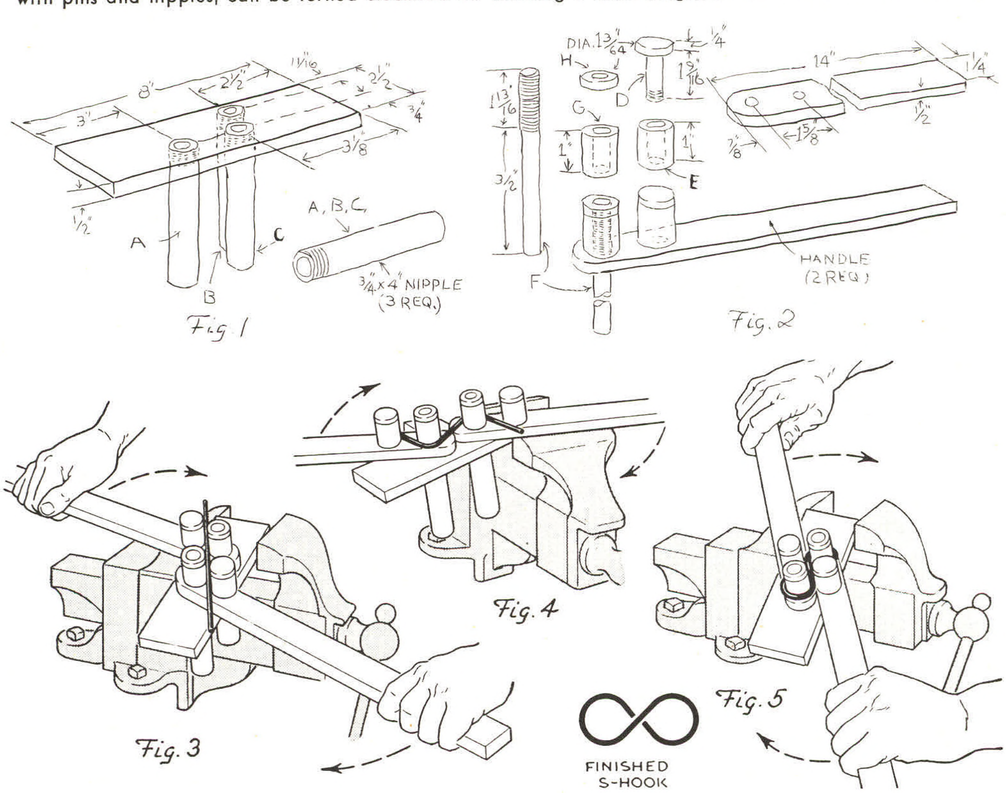
When assembled for bending stock 8½" long, pin *F* of one handle fits into nipple *A* shown in Fig. 1, while pin *F* on the other handle fits into nipple *C*. In bending stock 10½" long, pin *F* of one handle is removed from nipple *C* and placed in nipple *B*. Should S-hooks be desired with larger eyes, shims can be placed around rollers *E* and *G*.

Figures 3, 4, and 5 show the first, middle, and final positions of the handles when bending straight stock into S-hooks. It is important that the stock be centered exactly between the rollers, as shown in Fig. 3, otherwise, the size of the eyes will not be uniform.—WILLIAM J. HARGEST.

Scotch Tape Marks Depth on Drill

TO INDICATE the depth of a hole to be drilled, a piece of black or colored Scotch tape may be wound around the drill or bit at the desired point. The tape is quickly removed after use and leaves no undesirable stickiness.—MARION E. WESP.

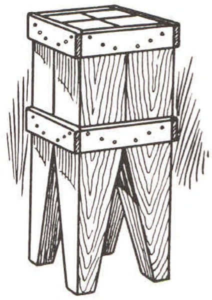
Nipples set in a drilled and tapped piece of flat stock form a firm base into which two handles, fitted with pins and nipples, can be turned clockwise for bending a short length of rod into a uniform S-hook



A HARDWOOD ANVIL

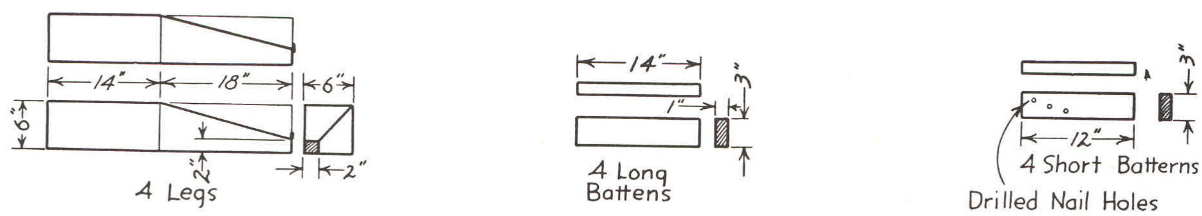
Allan F. Owen, East Saugatuck, Mich.

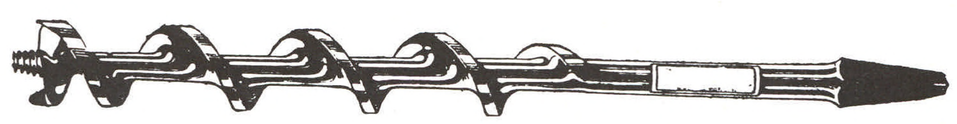
One of the very useful tools in our workshop is our home made handwood anvil. It is a portable work bench 14″ square and 32″ high and is used principally for nailing small parts together. The rim around the table serves to hold jack screws when we want to clamp parts in place for nailing or other work. The anvil has an end grain top and is heavy enough to stand still of its own weight while work is being done on it. The anvil was made from a piece of 6″ x 6″ cherry 12 feet long that we had in our storage shed, and a piece of 1″ x 3″ cherry 10 feet long. It is put together with 16d nails in drilled holes. The holes in the battens are necessary to avoid splitting but none are necessary in the six by sixes. We find that 16d nails can be driven into this wood, but we have not been able to pull any out. We cut the six by six into four 32″ long pieces and took two cuts on each on the band saw to shape the legs.



The drawing of the parts shows full size 6″ x 6″ and 1″ x 3″ lumber. If dressed lumber is used, allowances must be made in the lengths of the battens. If the legs are 5½″ x 5½″ and the battens are 2⅝″ x 3¾″, the short battens will have to be 11″ long and the long ones 12½″ long.

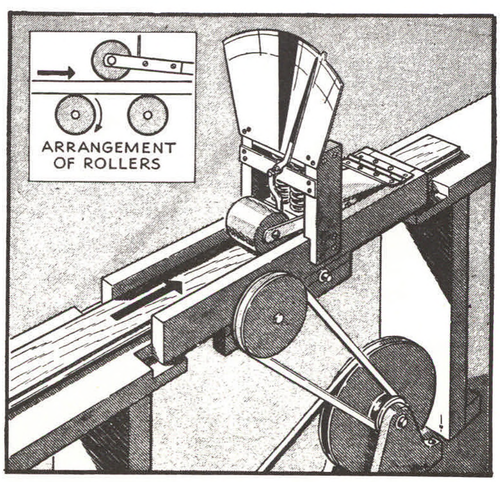
Our anvil weighs 78 pounds. We think hard wood is better than soft, but would use oak wood again as it is easier to get than cherry. No attempt has been made to finish this table, as it is a workshop tool and we like the saw cut surfaces.





Improvised Thickness Gauge Sorts Flooring Boards

FLOORING is quickly graded for thickness by the simple, inexpensive wood gauge at the right, devised by a Dickinson, N. D., building contractor. Aimed to eliminate hand grading, this device is made of three hardwood rollers placed on shafts with babbitt bearings. The flooring is pushed over two of the rollers, while the third, which is spring-loaded by two automobile valve springs, rolls on top of the wood. The top roller determines the movement of the dial hand, which in turn indicates the various thicknesses of the flooring. The mechanism is estimated to have saved 100 times its cost in sandpaper and hand labor.

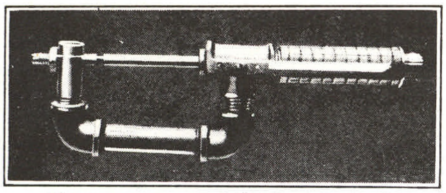


Shotgun Shell Forms Dial of This Ingenious Micrometer

By Francis H. Van Hise

FOR my own use I constructed a micrometer that is made up chiefly of pipe fittings and a brass shotgun shell. The general appearance of the instrument is shown in the illustration. The drawing explains just how the head was assembled and the dial marked.

The spindle *A* is a piece of ¼-in. steel rod, threaded at one end. This passes



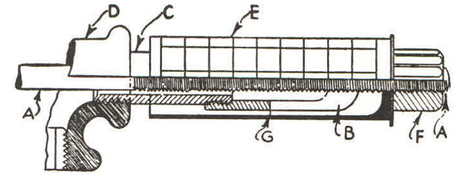
Measurements to 1/200 in. are made with this 2-in. micrometer

through the piece *B*, which is a cap fitting on the short piece of pipe, *C*. This piece screws into the pipe tee, *D*.

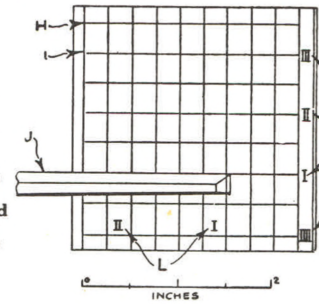
After tapping the cap *B* so that it was a very tight fit for the spindle, I split it with a hacksaw as far as the point marked *G*.

The dial *E* is a 12-gage brass shotgun shell. To lay it out, I removed the faceplate of my lathe and divided it into 8 equal parts. Then I turned a piece of wood to fit into the open end of the shell and placed this in the lathe, fastening a lathe dog to the outer end of the stick and tying it as tightly as possible. I revolved the head of the lathe until a pointer attached to the lathe was exactly in line with one of the marks on the faceplate. Next, I adjusted a very sharp diamond-pointed tool, laid on its side, so that it would just scratch the brass shell, and fed the carriage by hand so as to make a fine and accurate line the length of the shell.

After marking out the eight lines in this fashion, I turned the tool and made the lines around the shell, ¼ in. apart. When



How the dial is laid out in squares and mounted on the spindle



the shell had been fitted to the spindle, I used a nut from an old sight-feed lubricator (*F*) to lock it and to serve as a handle. Holding the spindle true is accomplished by *B*.

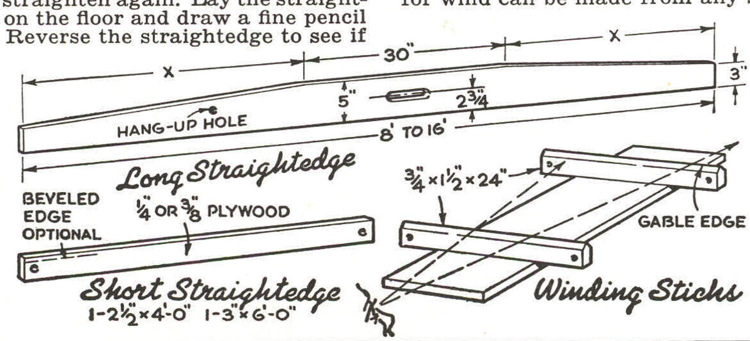
The anvil is adjustable, as shown in the photograph. The pointer *J* is held to the pipe tee by a screw and two pins.

The spindle should have 25 threads to an inch if the micrometer is to read in hundredths of an inch. The lines marked *K* in the diagram give the hundredths and the lines marked *L* show the inches, half inches, and quarter inches. A little practice makes the reading of the dial quite easy. Since there are 25 threads to the inch, turning the nut and the dial 25 complete revolutions moves the shell 1 in. That advance is registered by the relative movement of the vertical lines on the shell as shown in the drawing past the vertical right-hand edge of the pointer. Each time the space between two of the horizontal lines on the shell passes the upper horizontal edge of the pointer, a distance of 1/200 in. is recorded, and when two spaces pass by, 1/100 in. Finer divisions can be estimated by the eye.

WOODEN STRAIGHTEDGES

Select straight-grained white pine for long straightedges. True one edge, gauge the width, and rough-taper the back. Apply three coats of spar varnish for waterproofing. Hang up for a few days to allow any warping to occur; then straighten again. Lay the straightedge on the floor and draw a fine pencil line. Reverse the straightedge to see if edge matches, and correct accordingly.

Three-ply stock is suitable for shorter straightedges. These also should be seasoned for a time before final straightening. "Winding strips" to lay on the ends of boards and sight across for wind can be made from any scraps.



An Inexpensive Heater for Farm Watering Tanks

AS an inexpensive though efficient substitute for the portable heaters now on the market to keep the water from freezing in watering tanks for farm stock, the following idea will prove of value.

Procure an old but tight hot water boiler and cut it down to a height which will allow it to project at least a foot above the maximum water level in the tank. Plug up all side openings with regulation pipe plugs, threading in tight to prevent leakage.

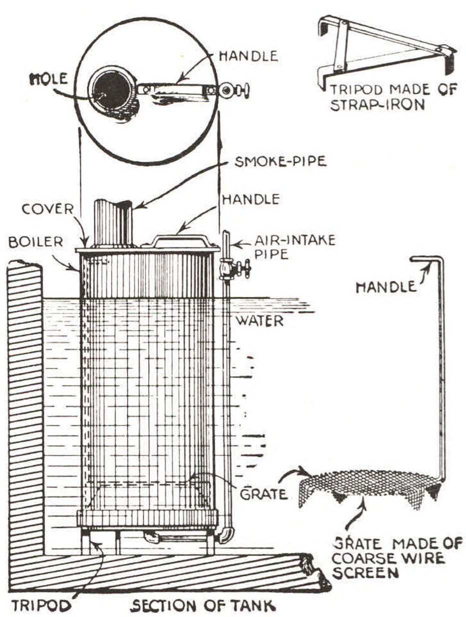
Cut out a cover of sheet iron for the top and provide it with several lugs around the circumference to hold it snugly to the sides. One side of the cover is supplied with a hole for a small stove pipe. This should have a collar to prevent its slipping down in the boiler. Attach a handle of strap iron to the opposite side of the cover.

The air intake is composed of piping, as shown, which is threaded into the hole in the bottom of the tank. If desired, a valve can be inserted in this pipe to regulate the supply of air.

As the intake pipe projects below the bottom of the tank, construct a tripod of strap iron like that shown in the sketch so the piping will just clear the tank bottom.

A grate is made by cutting out a square of heavy screen wire and bending down the corners so it will stand in the inside of the boiler about 6 in. above the bottom. A stiff wire handle should be attached to lift the grate out when cleaning.

This heater is simply placed in the water at one end of the tank and a fire built on the grate of slow burning material which can be replenished at will by raising the cover. Draft, of course, is regulated by the valve in the intake pipe and a damper in the smoke pipe.—WINDSOR CROWELL.



Here is a heater that is simply placed in the water at one end of the tank; then a fire is built in it

How to Make a Pair of Climbing Spurs

THE regulation lineman's climbers or spurs are somewhat expensive, but any boy may easily make a pair just as strong and equally as serviceable for about one third the cost.

Procure two pieces of common tire iron 27 in. long and 1½ in. wide—such as is used for buggy tires. Measure off 8 in. from one end and bend over at right angles, to make the foot-rest 4 in. wide, and the upturned part also 4 in. wide.

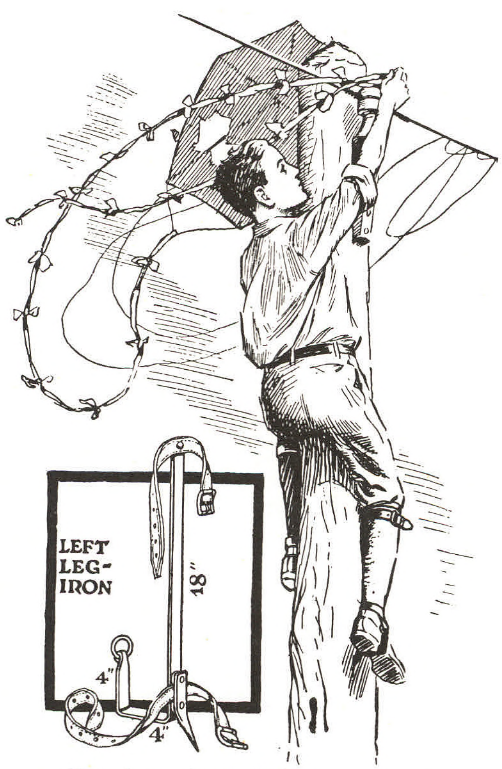
Now turn over one inch of the short upturned end and before closing, insert a 1-inch harness ring in the iron strap thus formed.

For the spurs, use two pieces of steel tire, about 5 in. long. Bend at an angle of about 45 degrees and draw out to make a point. Drill two holes along the shanks of the spurs, and solidly attach by riveting. In doing this, use rivets of about 3/16 in. size and 1 in. long. Place a burr or washer between spur and leg iron before riveting together; this makes a slot for the foot strap.

The knee strap should be about 1½ in. wide, and is attached to the top of the leg-iron by either turning over the end, or by riveting. Be sure and place them on the same side as the spurs, however.

The foot-straps are attached by running the strap through the slot made by the burrs between the rivets, once around the ankle, thence through the ring and then buckled.

Any blacksmith can supply the material for this home-made climber and will drill the holes and supply the rivets, or make the whole thing for fifty or sixty cents.—STILLMAN TAYLOR.



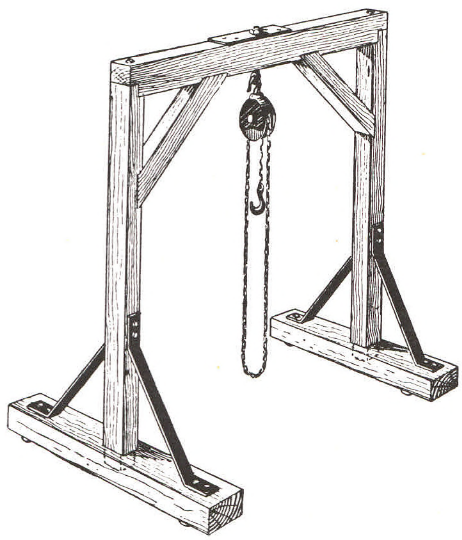
Here is a pair of climbing spurs that will enable you to cut tree limbs, etc.

For Small Garage Owners

You can make a shop crane for lifting engines

A SHOP crane in a small garage that was very inexpensive to build proved extremely useful in lifting automobile and truck engines in and out of the chassis. Its use on a few jobs paid its initial cost. The crane was constructed as follows:

A piece of timber, either spruce or hard pine, 8 in. long, 4 in. wide, and 8



In small garages the usual way to lift an engine or heavy part is by falls and tackle suspended from the roof. A home-made crane eliminates this tiresome work

in. deep, is needed for the cross or top piece. This is used to carry the block and tackle.

Next get two pieces 8 ft. by 4 in. for the uprights or side pieces. For the floor pieces take two pieces of heavy plank, each 3 ft. long, 4 in. thick, and 8 in. wide. Cut a mortise in one end of the uprights 2 by 4 in. long. Make a hole exactly in the center of each floor piece to match the mortises.

The top end of the uprights should be squared. With a square lay off on one end of the first upright a line 4 in. from the end. Turn the stick over sideways and continue the line around until it meets the line where it started. On this line, 1 in. in from the edge, make a cross mark. Turn the stick over half way, and mark again, making sure that the crosses are exactly opposite each other. Do the same on the end. Take a saw and cut out the block on these lines, and repeat the operation on the second upright.

Square the ends of the 8 ft. by 8 in. by 4 in. thick stick. Then, with the square, lay off 3 in. from the end, and square this around the stick until it meets the line at the start. Next measure off 4 in. on this line and mark it. Do the same on the opposite side, being sure that the lines are directly opposite. Mark off the end in a like manner, and then take the saw and cut this block out. The block will be 4 by 4 by 3 in., leaving the ends of the stick 4 by 4 in. and the cut-away portion 4 by 4 in. and the depth cut 3 in. Do the same with the other end of the stick.

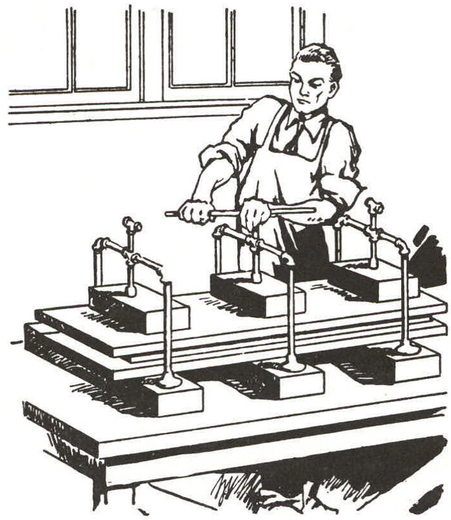
Have a blacksmith make the necessary strap- and brace-irons. For the bottom of the uprights you will need four heavy braces of flat iron 3 in. wide and ¼ in. thick. These irons should be 2 ft. 9 in. long, with holes drilled in the ends for ½-in. bolts.

On the same line with the cut at the top, 18 in. down from the top of one of the side pieces, draw a line with the square. Follow on down the side, and mark off 1 in. on this line. Turn the stick, and mark the opposite side in the same manner; 6 in. above this toward the top square off another line. With a saw cut out this triangular piece. Do the same with the cross-piece at the top. These are the seats for the corner braces of 4-by-4-in. stock, and later will be bolted together with ½-in. bolts. Work the other end in the same manner, marking off with the square 18 in. from the corner each way and cutting out for the brace seats.

When setting up the crane, start with the floor pieces. Next, set up an upright with the notches on the stick to the side. Be sure that the mortises at the bottom fit snugly. The upright can either be nailed or a hole bored and a bolt put through it crosswise of the plank.

Set up the other upright in the same way, and put brace-irons on the bottom, bolting them into place as you go. Laying off the two sides about 9 ft. apart on the floor, with the brace slots and notches at the top facing, put the cross-piece into place. Raise the ends of the side pieces from the floor and rest them on a box. Set them into place, and the job is complete.

Veneer Press Made of Steel Pipe Has Movable Units



THE ultimate goal of most home woodworkers is the mastery of veneering technique. Not until a workshop is equipped to lay richly-grained veneers on sizable panels can the craftsman duplicate some of the fine furniture he wants to own. Aside from their advantage in appearance, veneered panels have practical value; they are less subject to warp and they cost less than solid wood of good cabinet grade.

With very little effort and expense on the part of the home craftsman a highly satisfactory veneer press can be made of pipe and pipe fittings. A press of the type shown in the accompanying sketches can be made to handle any size of panel that the craftsman may want to veneer. The pressure units are made as separate, movable pieces as shown in Fig. 1. The number of these units required will depend on the length of panel to be veneered. Three units will handle panels up to 24" in length.

The pipe and fittings may be obtained from the local plumber already cut to size and threaded as required. If 3/4" pipe is used throughout, as suggested in Fig. 1, the horizontal nipples should not exceed 6" in length. If a pressure unit capable of handling panels wider than 12" is needed, the use of larger pipe, measuring 1 1/4" in diameter, is advisable. In this case, each horizontal nipple may be as long as 12". When the pipe is being purchased, double extra-strong pipe should be specified.

The base of each pressure unit is made of 2" x 6" wood, having a length of at least 8" greater than that of both horizontal nipples. If each horizontal nipple is to be 6" in length, then the length of the base should be 20". The vertical pipe of the pressure unit should have a minimum length of 6"; this size will provide sufficient depth for veneering 3/4" stock. If assembled boxes or other deep units are to be veneered, vertical pipes must be longer.

The center pipe should be at least 8" long and should be threaded its full length. The tee that receives the horizontal nipples must have a clearance hole drilled through it to permit passage of the vertical center pipe. The various pipes and fittings are assembled, as shown in Fig. 1, before the flanges are bolted to the base with stove bolts.

When the veneer press is put into service, cauls must be provided for covering the panel that is being veneered, as shown in Fig. 2. Each caul is made of several pieces of 3/4" stock measuring a little longer than the panel being veneered. Cauls are faced with a sheet of 1/4" plywood or fiberboard as shown in the sketch. A block of 2" x 6" stock is placed between the caul and the end of the pressure screw to distribute the pressure.—*Daniel D. Wiseman.*

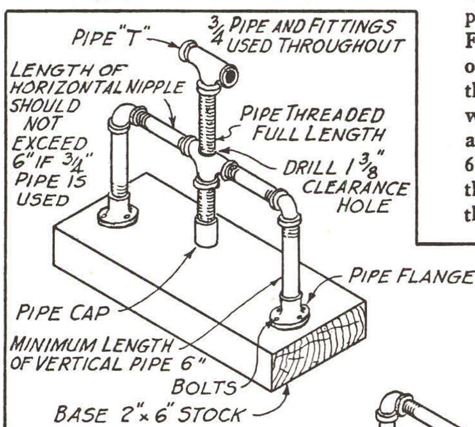


FIG. 1

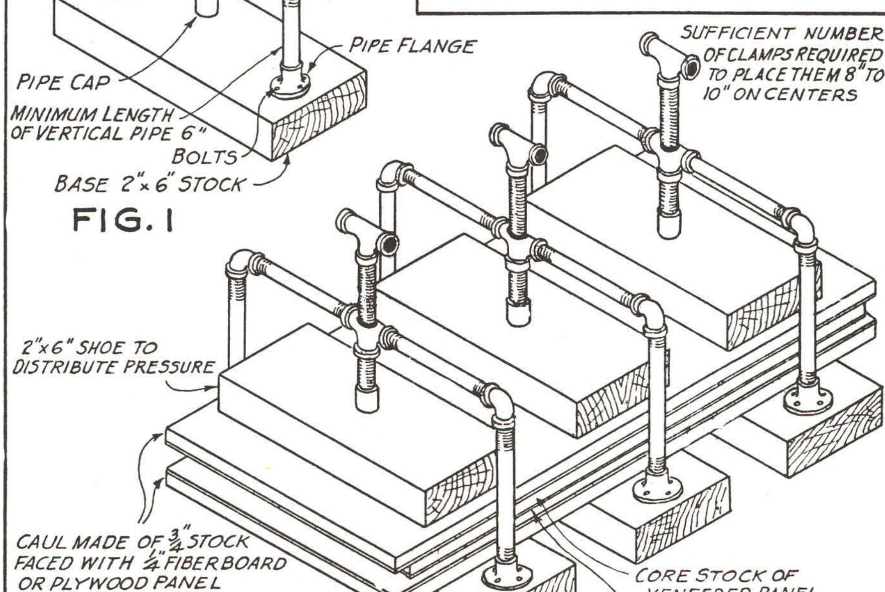


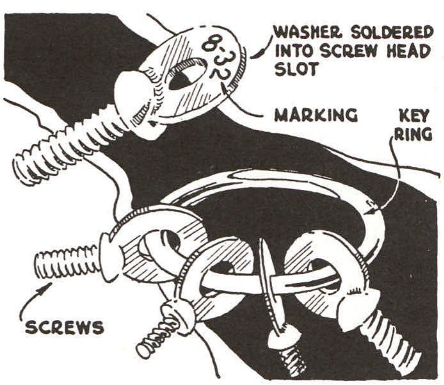
FIG. 2

Machine Screw Gauge Easily Made

A CONVENIENT machine screw gauge that identifies not only the number of threads to the inch but also the screw diameter can easily be made as shown in Fig. 1. A machine screw of each size needed for the gauge is fitted with a washer as shown. Brass screws and washers are preferable since brass is easier to solder than is steel. These screws can be placed on a key ring or loop of wire. They are used simply by trying one or another in the tapped hole to be identified.

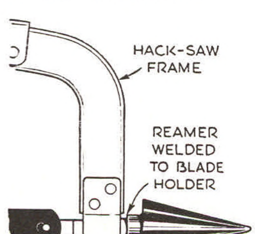
The numbers stamped on the washer serve to identify the screw diameter and number of threads per inch. If a set of numeral stamps is not available, the numbers can be etched or scribed with an electric tool.

Etching is done by coating the washer with an acid resist such as wax or asphaltum varnish. The wax can be applied by melting a quantity in a container and then dipping the washer into the wax. If asphaltum varnish is used, it should be brushed on. When the varnish is dry or the wax has hardened, the numerals can be scratched through the coating and into the metal with a sharp pointed instrument. The prepared washer is suspended in nitric or sulphuric acid where it is held in the liquid by means of a copper or brass wire that has been coated with the acid resist. After the metal has been etched, the resist can be removed with turpentine.—*T. T.*



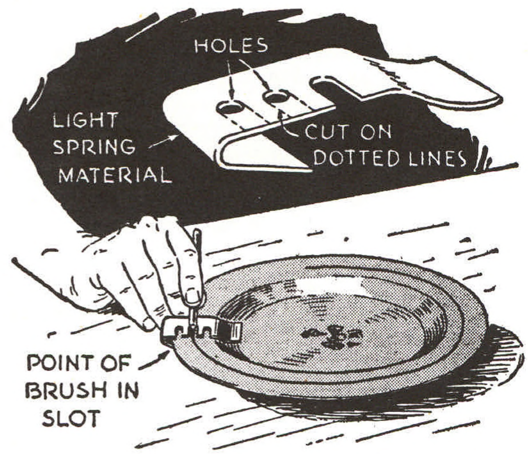
Reamer Welded to Hack Saw Removes Burr in Conduit

SHORT circuits sometimes result from failure to ream the burr out of conduit after it has been sawed to length, especially if the conduit is crowded with wire. By welding a reamer onto the hack saw, as shown, you have a double-purpose tool that makes it easy to ream conduit after it is sawed.—RANDOLPH DE FREITAS.



China Painting Made Easier

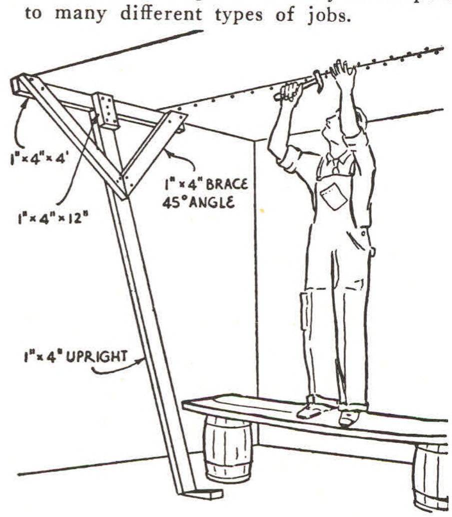
THOSE doing china painting and firing will find the little gadget illustrated below a great help in ring striping, etc. Shape a small piece of thin scrap metal as shown, drill several holes through it, and cut with a hacksaw as indicated by the dotted lines. In use, the gadget is slipped over the edge of the plate and moved along, as the brush draws a perfect line guided by one of the slots.—*A. H. W.*

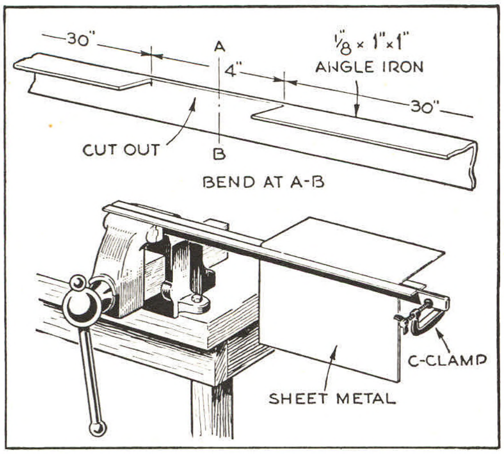


Prop Aids Wallboard Installation

WHEN wallboard is being applied to ceiling or wall, a tee-shaped prop will be extremely useful. The bar of the tee should be faced with canvas or rubber to protect the wallboard. Stock lumber 1" x 4" is used throughout; wood screws 1½" long assemble the members.

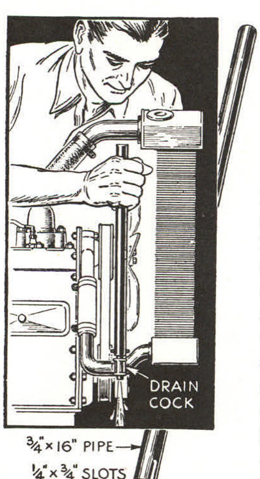
With two of these props, each placed a foot from the ends, a large panel can be held securely against the ceiling beams while nails are driven to fasten the panel in place. When used to hold wallboard on a sidewall, a sack of dirt is used to brace the foot. When a person works alone on repair jobs, props like these help to hold things in place and may be adapted to many different types of jobs.





Jig Forms Right-Angle Bends in Wide Sheet-Metal Work

NEAT right-angle bends in sheet metal up to 27″ wide can be formed easily with a simple jig made from a 64″ length of ⅛″ by 1″ by 1″ angle iron. A section 4″ long is cut out of one side and the piece is bent double at the center of this part so that the sides touch. It is sprung apart to insert the sheet metal. With the open end fastened in a vise and a C-clamp at the other, as shown in the drawing above, the work is bent over by hand as far as possible. A mallet is then used to flatten the bend gradually to a sharp angle. The outboard end of the fixture is supported with one hand or by a length of pipe or lumber placed under it.—R. BOETTINGER.

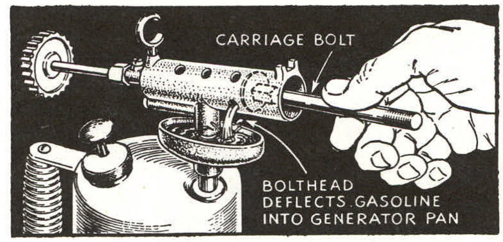


Slotted Pipe Easily Opens Radiator Drain

RADIATOR draining is made easy with a section of ¾″ pipe 16″ long and slotted at one end, as shown at the left. The pipe is easy to lower over the usually inaccessible petcock to open or shut it. It will save scratched hands and spotted sleeves—to say nothing of tempers.—V.C.

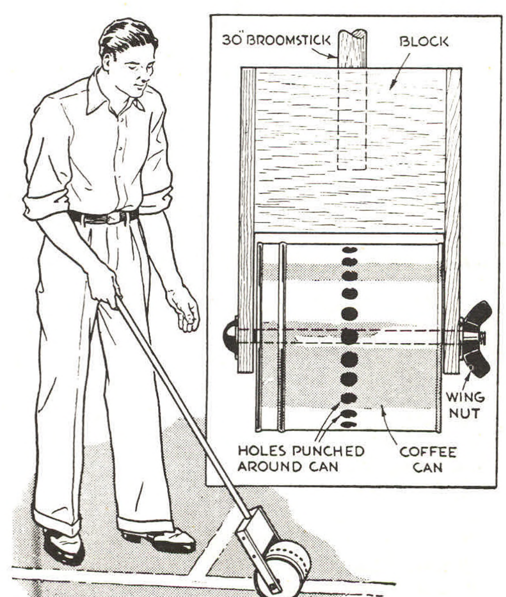
Bolt Aids in Starting Torch

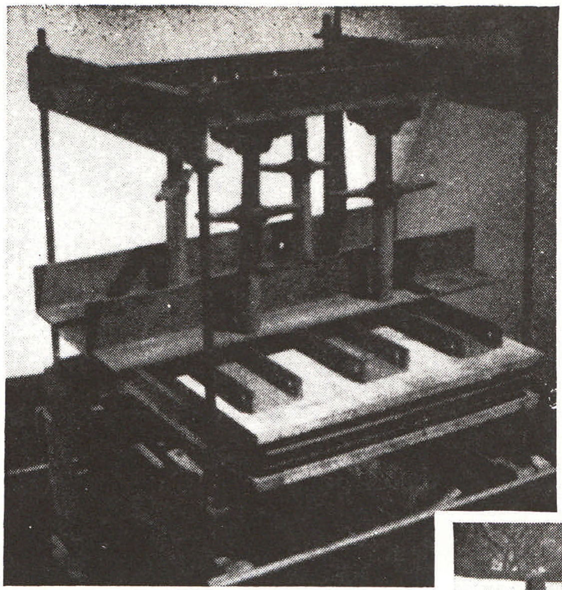
WHEN starting his blowtorch, one tinsmith inserts a large roundhead bolt into the burner cylinder as shown in order to deflect the stream of raw gasoline down into the generating pan until it is filled.



Game-Court Lines Laid Out with Homemade Marker

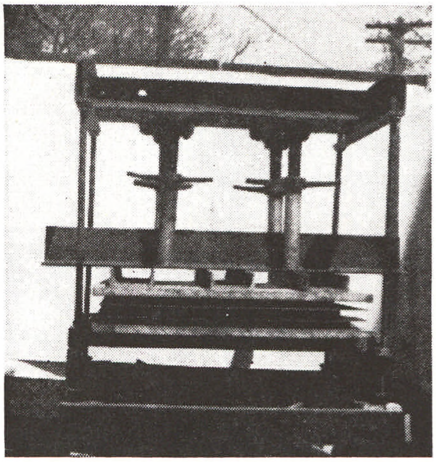
A MARKER that will do an excellent job of laying out tennis or badminton courts, base and goal lines, and can be taken along on outings when desired, requires but a few minutes to be made from scrap parts. Punch a ring of small holes around the side of a 1-lb. coffee can and a ⅜″ hole through the center of the lid and bottom. Use a long bolt, washers, and a wing nut to mount the can in a fork made by nailing two pieces of wood to a block slightly wider than the container. Bore a hole lengthwise in the block and drive in a short broomstick handle. To fill with marking powder, take the can out by removing the wing nut and bolt. Use regular court powder, and do not fill quite full.—GERARD BONVOULOIR.





VENEER PRESS

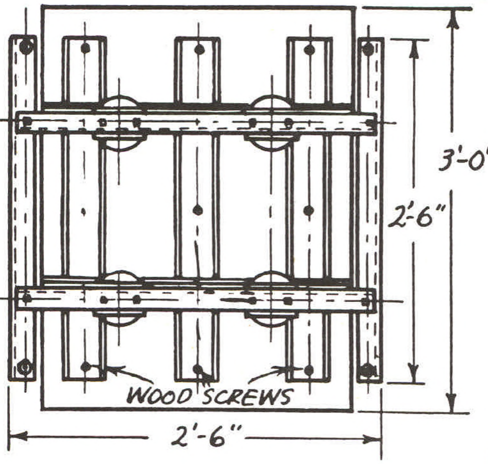
By A. C. STARK



THIS veneer press contains features somewhat different from the presses on the market in both construction and application of pressure. The presses of home construction usually lack the rigid requirements necessary for such work. They also have a tendency to rack and warp. The press given here should appeal to the average craftsman, for the simplicity of its construction, low cost and the ease of securing all parts which are standard.

Made from junk steel easily picked up in any junk yard. The only machine work necessary is threading four rods and drilling holes in channels. The top and bottom pads are made of 1⅛″ maple reinforced by 4″ channels, and fastened thereto with round head wood screws. Two cowles of ⅛″ Masonite are placed next to the veneer surface on top and bottom, separated from veneer with paper. The ¾″ rods are tension rods only and will take approximately 8000 pounds each. You will note the only compression stress in the rods is the weight of the jacks and the four channel irons. The bottom pad is fixed but the top must be removed for insertion of work, but the weight is not excessive and can be easily handled by the average man. The press is rigid and overcomes the tendency to rack, common in most presses used or built for home use. Also, the pressure is uniformly distributed due to each jack being in center line of each square foot of surface.

The grain of maple in pads is at right angles to channel reinforcing. As jacks vary in length, rods must be cut so as to allow about 8″ clearance between the lower pad and the bottom of jack screws. Each jack has a sleeve to take pressure, made of 1¼″ pipe or some pipe to make a sliding fit over jack screw.

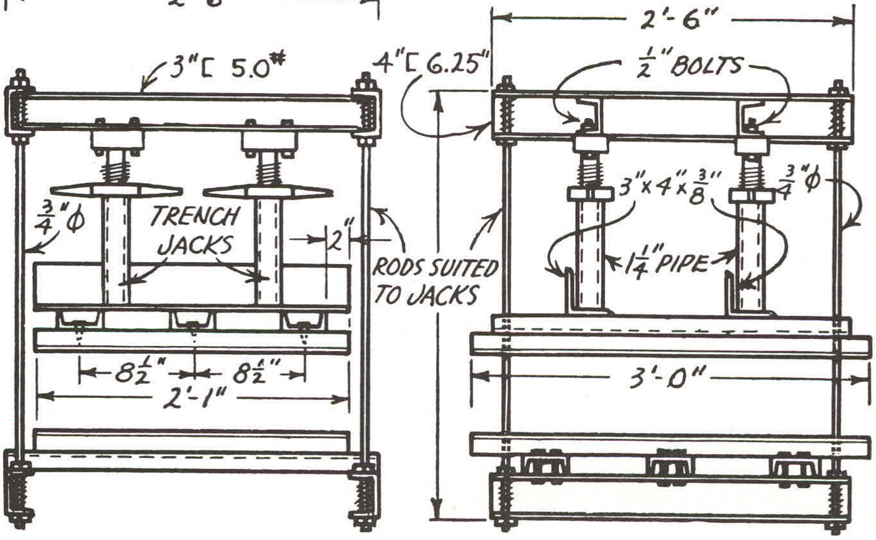


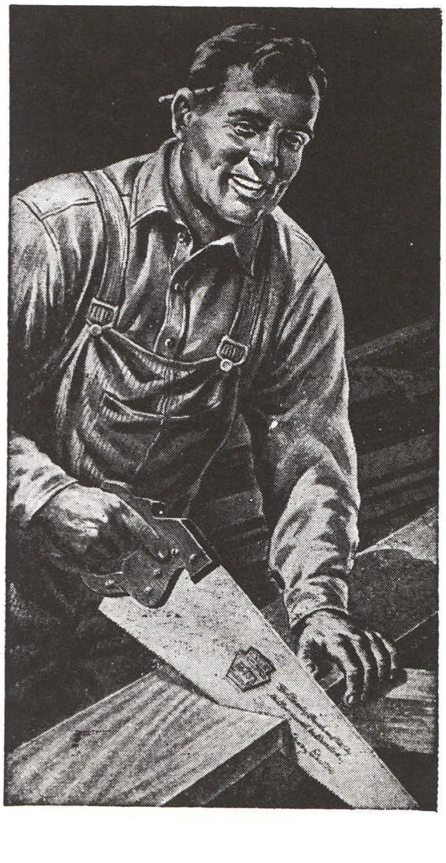
BILL OF MATERIALS

2 Pc. 4″x3″x⅜″ Angle 30″ Long
10 pc. 4″ Channel 6.25#—30″ Long
2 pc. 3″ Channel 5.00#—29½″ Long
4 Rods ¾″, Threaded 6″ Both Ends with 16 nuts
4 Trench Jacks
2 Pc. Maple 1⅛″x25″x36″
2 Pc. Masonite ⅛″x25″x36″
4 Pc. 1¼″ Pipe to Suit Length of Jacks

The jacks in the press are 13″ long overall and 1¼″ in diameter. In operation, the Masonite is placed on the lower pad. A couple of newspapers added, the work then added, plus some more paper. The top Masonite is then placed over work and the top pad slid into place. The two angles placed thereon and pressure applied by the four jacks.

The jacks used in the press are trench jacks used by contractors to back up shoring, etc. The pressure possible with the above, far exceeds that exerted by ordinary handscrews. The working area can be increased by application of handscrews at each end of press.

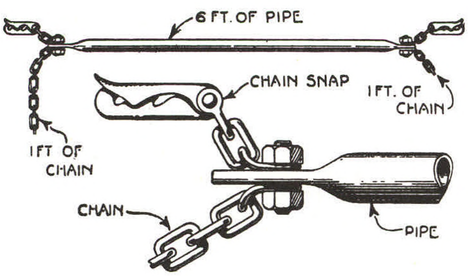




Tow Automobiles with a Rigid Tow-Bar

INVARIABLY when an automobile has broken down in the streets or on the road, the owner of a small garage will send the first available car, equipped with a piece of rope or tire chain that he may have on hand, to the scene of the breakdown to tow in the derelict. The driver of the towing-car has frequently an exciting time, especially when it is necessary for him to drag the broken-down car through city streets with much traffic. When he is compelled to make a sudden stop the towed car will often run into the rear end of the pilot and both cars are damaged.

All this can be avoided if the owner of the garage were provided with a rigid tow-bar for dragging the disabled



Never attempt to tow a disabled automobile with a rope. Use a rigid bar

vehicle through the streets. A rigid bar is by far the best means, as it keeps the two cars at a fixed distance from each other. Regardless of the conditions of the brakes of the disabled car, it will come to a stop when the towing-car stops.

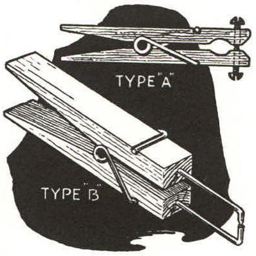
In the accompanying illustration a tow-bar is shown which can be made from a 6-ft. section of 1-in. wrought-iron pipe, 2 short pieces of chain, 2 bolts, and 2 tire-chain snaps. The pipe is flattened at each end, and chains and snaps are attached by bolts through drilled holes in the flattened ends. If no iron pipe is available, a correspondingly heavier wooden bar may be used to the ends of which the chains and harness hooks are attached.—G. A. LUERS.

Sandpaper Cutting Gauge

SANDPAPER can be divided into half and then quarter sheets quickly and neatly by making the cutting gauge illustrated below. A 10" twenty-four tooth hack-saw blade is fastened to the outward-beveled front edge of the board, with the teeth leaning in the same direction you will face while cutting the paper. The teeth should extend at least 1/16" above the top corner of the board.

The block is 6" by 9¼" with stops at the back for tearing sheets in half, and another for quartering

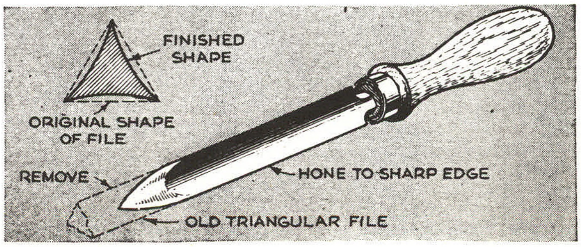
Spring Clothespins Changed into Soldering Clamps



SPRING clamps for holding small metal parts that are to be soldered or brazed can be made from ordinary wooden clothespins. For the type shown at *A*, clamp a clothespin in a vise so that the jaws will remain in line and drill a hole slightly smaller than the roundhead screws to be used. After the screws have been inserted, pass a thin file between the points to flatten them.

Clamp *B* is used where very small pieces are to be held for soldering. It consists of two pieces of wood shaped as shown to take the spring from a spring clothespin. The metal jaws are two nails. One is flattened on the end, and the other is left pointed.—J.A.A.

SCRAPERS for putting the finishing touches on metallic surfaces can be made from worn triangular files. The three surfaces of an old file are hollow ground on a grinding wheel and brought to a point for use in narrow openings. The tool will have long-lasting edges, ideal for removing scratches, high spots, and burrs.—EDWIN DREWITZ.

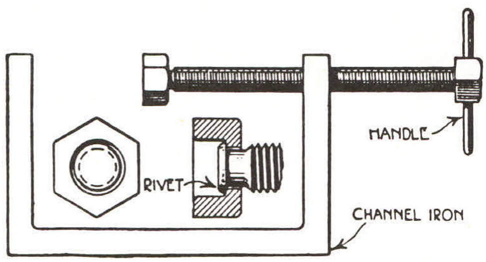


How to Make Your Own Cabinet Clamps

A CABINET-MAKER'S clamp suitable for the amateur's work-bench can be made of a section of channel iron and a discarded bolt as follows:

Cut out a section of heavy channel iron about 1 in. wide. The width of the iron between sides should be enough to furnish jaws of sufficient opening for ordinary work.

Select a suitable steel bolt and drill and tap a hole near the top of



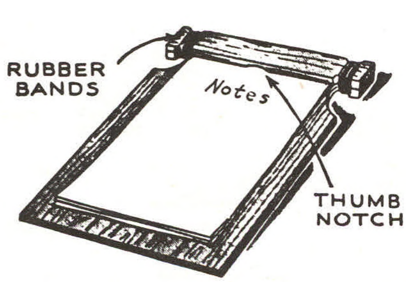
Channel iron and an old bolt will make an excellent cabinet clamp

one of the jaws of the clamp into which the bolt can be threaded. A second hole through the bolt-head should be drilled to take a short piece of rod for a turning handle.

File the end of the bolt smooth and round and about half its original diameter.

The bolt should then be set through a hole in a nut. One half of the nut is hollowed out and the end of the bolt then can be riveted over so the nut will revolve easily but will not allow the end of the bolt to project beyond it. Thus the bolt, when turned down on any article, will not mar it.

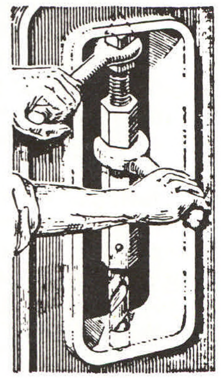
Such a clamp is cheap, simple to make, and will do the work required of it as well as the more expensive kind.



Plywood cut to required dimensions and notched as above makes a handy clip board. A strip at top, notched to match, is held by rubber bands

A Drill for Cramped Quarters

FEW repairs are more annoying to undertake than the replacing of a stud that has been broken off in a place that cannot be reached, even with a ratchet drill. A piece of hexagon steel fitted with a drill at one end and a feed screw at the other will sometimes save the day, as it can be turned in a very small space.



Drilling in an especially tight place

Easily Made Cutter Removes Burrs

BALANCE and weight make the burr cutter shown an efficient accessory for the small machine shop.

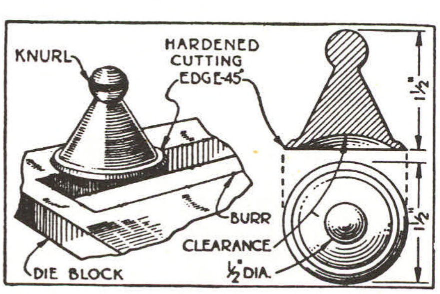
The cutter is easily machined, being circular in shape and having a tapered body and round knurled handle.

The cutting edge is formed at a 45-degree angle and is hardened back far enough to allow ample stock for repeated sharpenings.

The clearance (see illustration) should run back at least $\frac{1}{16}$ in. from the edge, and the bottom of the cutter should be ground so that it is absolutely flat and square.

In use the cutter is placed flat on the work and is moved in a sliding circular manner over the burr to be cut. This gives the cutter a shearing action and makes the cutting easy.

The knurled handle and perfect balance of this cutter, together with its weight, makes it easy to operate with a surprising degree of speed and accuracy.—F. J. WILHELM.



The burr cutter has a 45-degree, hardened, cutting edge on its outer circular surface.

This simple cutter for saplings works on the scissors principle, the operator simply pulling the handle

Clipping Down Young Trees

MR. GEORGE ULRICH, a Wisconsin farmer, decided to make a meadow out of some land of his on which there was a large growth of young trees. He and his son started hacking them down with scythes and axes — the usual way of clearing land. In a short time the scythes grew dull and the men became tired and discouraged. This led Mr. Ulrich to invent, as a quicker and easier means of cutting the trees, a tool that works on the scissors principle.

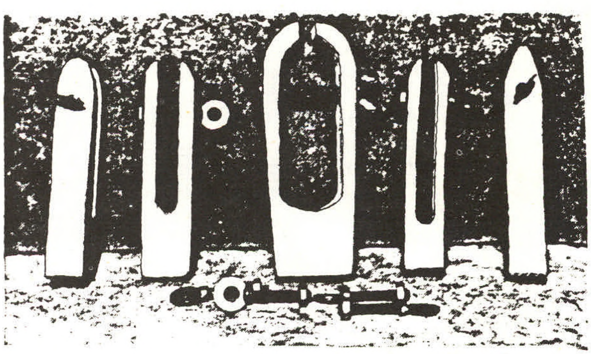
The base of the instrument is U-shaped, and has a very sharp front edge. Attached to this base is a handle, hinged so that it can travel back and forth. On the handle, near the bottom, is a curved arm on which there is a V-shaped blade.

The farmer places the base of the cutter on the ground, with its sharp edge against the tree and the curved arm around it. Then he pulls the handle, as shown in the illustration above, and the tree is swiftly and easily clipped off.

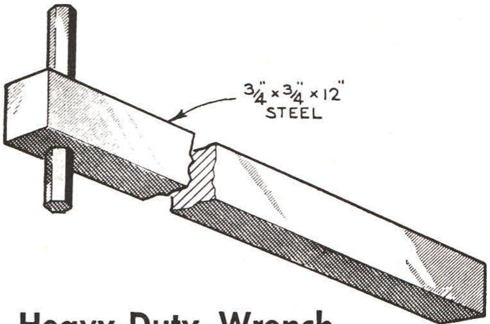
Anybody who has ever performed the back-breaking task of cleaning a piece of woods for planting will register a silent "thank you" to the inventor of this useful device.

Kindness to your tools is an ounce of prevention that beats a pound of cure

Variety of Clamps Sawed from Scrap Pieces of Oak



WOODEN clamps served the purpose of one craftsman who did not have enough metal ones for the job. They were made from scraps of ⅝" oak, some machine screws, and a few washers. A coping saw was used to cut the body of the clamps, and No. 10-24 fillister-head machine screws were employed in lieu of the ordinary thumbscrews. To provide thumbnuts for these screws, a simple but ingenious expedient was resorted to. A small washer was merely soldered into the slot in the head of each screw. The clamps shown were used successfully in the delicate work of cementing a large quantity of lapping stones in their metal holders. They can be made in almost any size.—DICK HUTCHINSON.

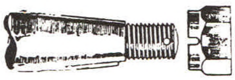


Heavy-Duty Wrench Removes Corroded Setscrews

MORE leverage for removing safety setscrews that have become corroded in their holes can be obtained by providing a stout handle for the setscrew wrench. Near the end of a steel bar of suitable size, drill a hole the dimension of the small diameter of the wrench. Grind a piece of the wrench square at one end and force it through, thus broaching the hole in the bar into a hexagon and obtaining a tight fit.—R. H. MCNAIR.

To Repair Your Battered Axle-Threads

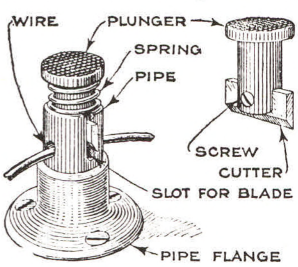
THE threads on an automobile axle are often battered when removing a wheel. If the axle has a castellated nut—and nearly all of them have—the nut can be run on to the axle backwards—castellations first—which will recut the threads. The castellations act as a cleaner for the nut, which is then just as good as a die. This suggestion is especially useful for odd-sized axles.



Running the nut backwards on the battered threads, the castellations make the threads as good as new

A Cutter for Heavy Wire

The wire or steel-rod cutter shown in the drawing is a "big brother" to the wire-cutting pliers. A piece of heavy pipe and a pipe flange form the body of the tool, the pipe being slotted to form guides for the cutter. A piece of cold-rolled steel is turned down with a shoulder to make a good sliding fit inside the pipe, and is slotted across the end to take the cutting blade, which is held in place with a flush-head setscrew, so that the blade can be removed for sharpening or renewal. The spring between the pipe and the plunger should be heavy, and have a reasonable amount of tension. Before screwing the cutter to the bench, a piece of round steel is tightly driven into the pipe from the bottom, until the end of the steel is flush with the hole in the pipe through which the stock to be cut is inserted. The piece is then sawed off flush with the bottom of the tool.

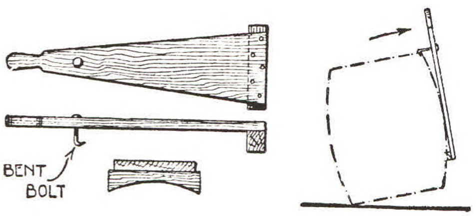


The finished cutter may be used as a part of the mechanic's tool kit, or mounted permanently on the workbench. Such a tool will be found indispensable where a large amount of heavy wire is to be cut into lengths. The tool is operated by inserting the wire through the opening and striking the top of the plunger with a hammer.—Elmer O. Tetzlaff, Milwaukee, Wisconsin.

A Labor-Saver for Persons Handling Barrels

WHEN the harvest season comes or when many barrels are to be up-ended and transferred from one place to another, the following idea for up-ending will be appreciated:

Cut out a piece of 1-in. or even heavier plank about the shape shown.



Where barrels are to be handled this device will be a time- and labor-saver

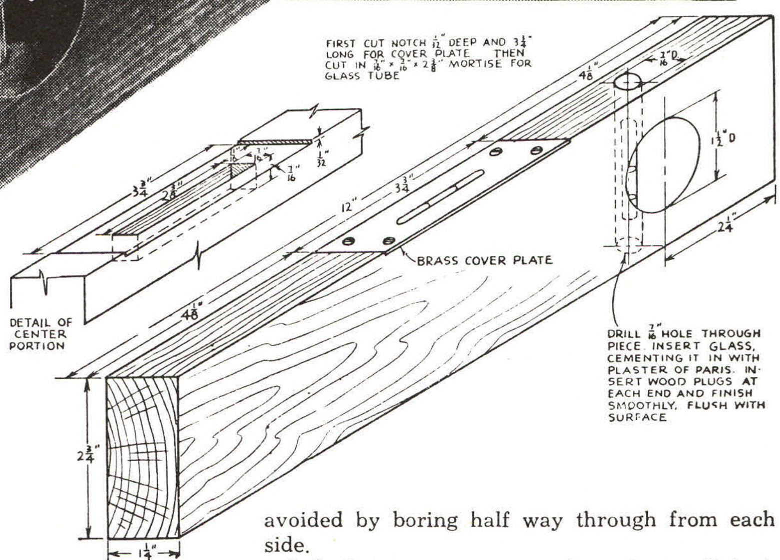
This piece should be the height of the barrel, 10 in. across at the bottom; the top fashioned like a rough handle.

Across the bottom bolt a piece of timber curved on the under side to fit the curve of the barrel. A bent and sharpened bolt is then put through the top of the lever as shown.

When being used, the lever is laid along the length of the barrel so the curved portion comes near the user. Then the hook is caught under the top hoop and the barrel can be lifted easily.

WOOD HAND LEVEL

BY I. M. FENN



THIS necessary craftsman's tool can be very easily made with a few common tools, in any size desired, at very small cost by following these directions and working from the blueprint:

1. Obtain a piece of wood (mahogany, walnut or any other close-grain wood) large enough to be trued to the following dimensions: 12 inches long, 2¾ inches wide, and 1¼ inches thick.

2. Make a layout according to the blueprint and cut a notch 1/32 inch deep, and 3¾ inches long for the cover plate.

3. Cut in a 7/16 inch by 7/16 inch by 2⅜ inches mortise for the glass level tube. This can be done by boring a number of ⅜ inch holes, ⅜ inch deep and using a chisel for cleaning out and finishing the mortise.

4. Bore a hole 1½ inches at the proper end, being careful not to split the surface—this can be avoided by boring half way through from each side.

5. In the same manner as above, bore a ⅞ inch hole, as shown on the blueprint, through the piece.

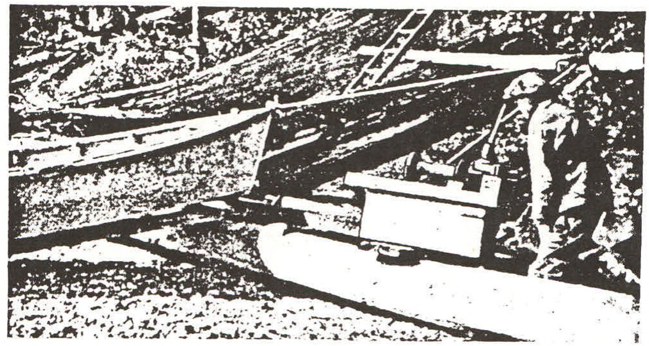
6. Insert level bulbs, cementing them with plaster of Paris, making certain that they are set in properly and carefully.

7. Fasten the brass cover plate, over the glass bulb, in the notch with screws, and insert wood plugs at each end of the other glass bulb and finish smoothly, flush with the surface.

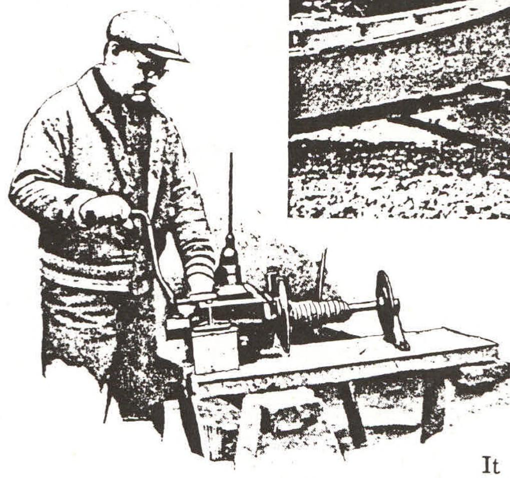
8. Level may be stained or finished in natural wood with a coat or two of clear lacquer or varnish and then waxed.

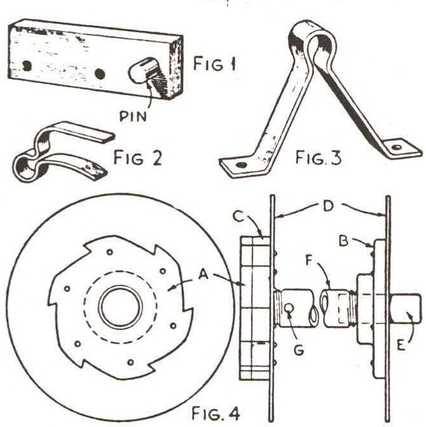
Note: Level bulbs and brass cover plate may be purchased at most any hardware store at a very small sum.

AUTO TRANSMISSION SERVES AS WINCH



Showing how the mechanism can be used to haul a boat up a long beach onto a dock or platform





Only these few, simple parts are needed to adapt the transmission for use as a winch

BY USING a junked auto transmission, a convenient and effective hand winch for hauling and hoisting can be made. The one illustrated was designed specifically for use in pulling a rowboat up a long beach onto a dock, but can be used also for lifting heavy loads and other similar work. It was made from a small transmission, but for heavier work, transmissions from larger cars could be selected.

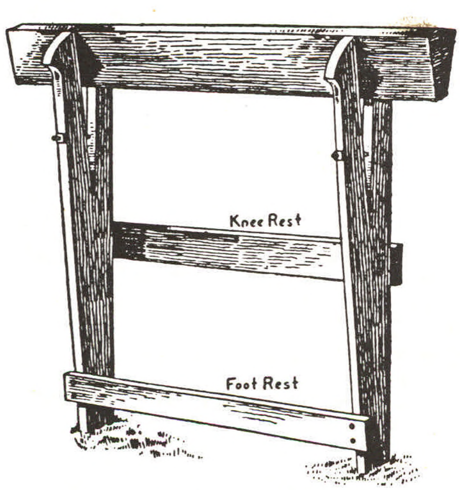
The three shifts from high, second, and low adapt the winch to light, medium, and heavy loads. These changes can be made very quickly. When there is no load on the drum, the shift can be put in neutral, the rachet released, and the rope reeled off without turning the gears.

The drum, shown in Fig. 4 of the sketch, was made from a piece of 1-in. pipe, threaded at both ends, with two 1-in. floor flanges. The length of pipe is determined by the amount of rope or cable to be used on it. In order to get the flanges to screw on the pipe for their full depth, it is necessary to cut the threads on the pipe smaller than standard or to tap out the flanges. In the mechanism shown, a 1-in. pipe was used as it just fitted over the end of the transmission driving shaft.

A in Fig. 4 is the flange next to the transmission, and *C* is a disk of hard wood riveted to *A*, both cut with notches for the ratchet. The two are riveted to a sheet-metal disk *D*, which in the present case was made of No. 18 gauge black metal, 6½ in. in diameter. Flange *B* at the outer end of the drum is riveted to a similar disk.

A short piece of 1-in. shaft *E* is driven into the drum spindle to form an outboard bearing supported by the bracket shown in Fig. 3. The drum is attached to the transmission drive shaft by means of a 5/16-in. pin through hole *G*, which is drilled through the pipe after it has been forced onto the shaft.

Figure 1 shows the metal block with a pin for the dog in Fig. 2. The holes in the block were drilled and spaced to fit stud bolts in the transmission casing. The block would have to be designed differently for some other transmission, but in any case should be attached rigidly to the casing in such a way as to allow the dog to engage the ratchet teeth. The removable crank was made from a starting crank by welding on a square socket that slips over the square end of the shaft entering the transmission.—GEORGE B. COUPER.

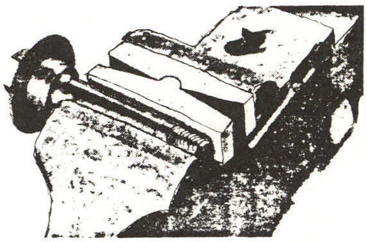


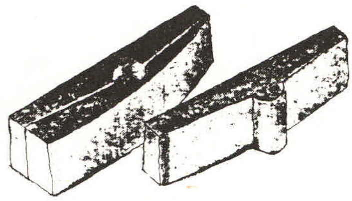
A Favorite Saw Clamp.

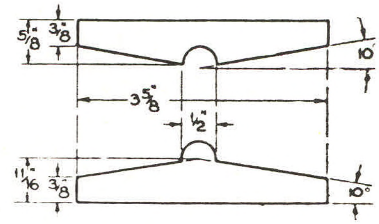
Swivel Taper Blocks Hold Tapered Work Securely In a Vise

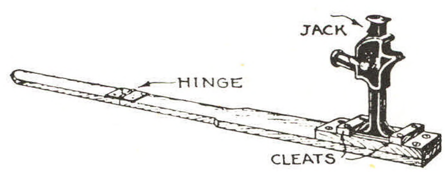
THE problem of how to hold tapered work in a vise can readily be solved by using a pair of swivel taper blocks, as shown below at the left. These blocks automatically set themselves to the angle of the work and hold it securely without damage or danger of slipping.

They can be made from cold-rolled steel, brass, or other scrap material. The center illustration, below, shows them partially completed. The semicircle in the female piece is drilled, as shown, before the block is finally cut to shape. Both pieces can be formed accurately on a metal-cutting band-saw or a shaper. They should be finished by hand filing to obtain an accurate swivel joint that will rock freely and adjust itself to the work being held.—C. W. W.



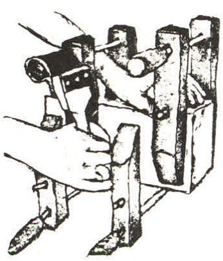


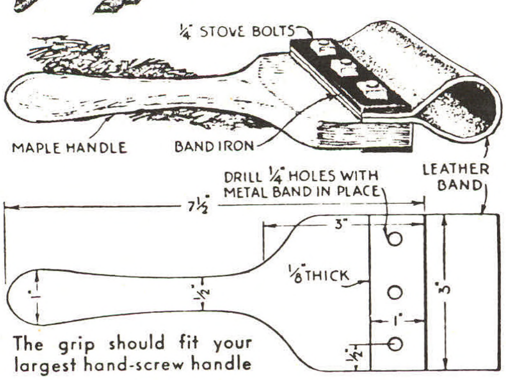




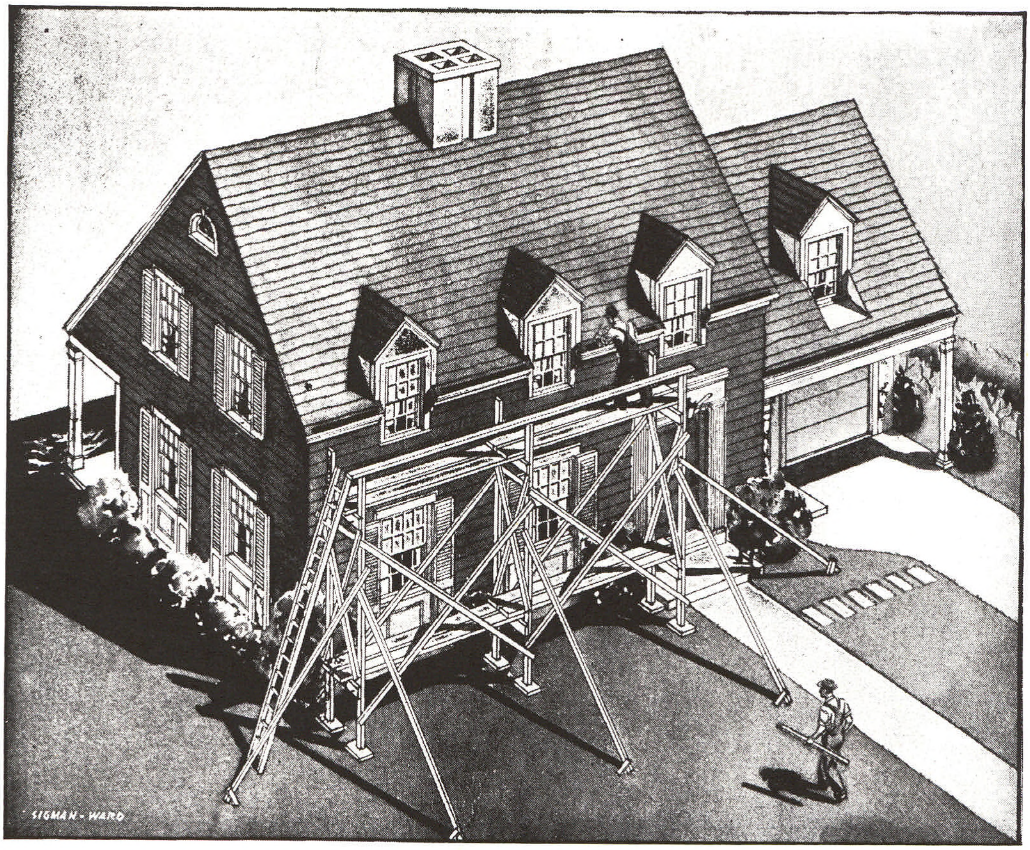
Auxiliary Handle Tightens Hand Screws Quickly

TIGHTENING hand screws requires little effort if an auxiliary handle is made as shown from maple or hickory. Select a strong, pliable piece of leather, such as old belting, for the grip. If you have several hand screws with handles of different diameter, select one with the largest handle, wrap the leather snugly around it, and use that size.—E. C. H.





The grip should fit your largest hand-screw handle



For repairs along the whole side of the house, a built-up scaffold is used with well-braced double uprights

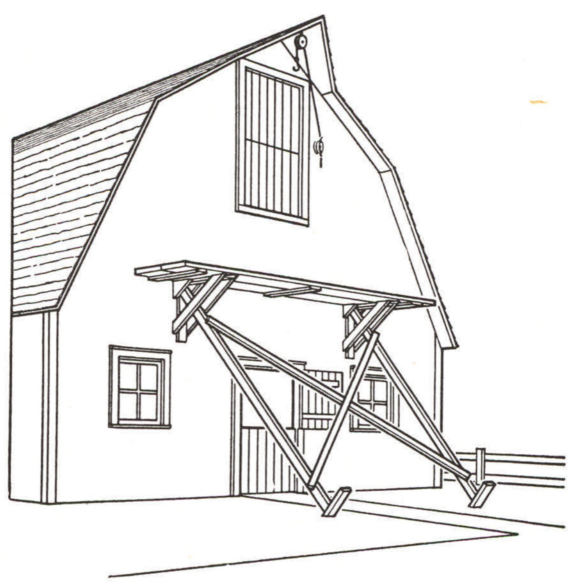
PROFESSIONAL TRICKS AID IN

SCAFFOLDS FOR HOME REPAIRS

How Any Handy Man Can Erect Substantial Temporary Staging

●

By HAROLD R. TERPENY



NEEDED repairs on the outside of houses frequently require a temporary staging, or scaffold. Therefore erection of safe and sane structures of this nature is of special importance to the home owner.

When the entire exterior is to be painted or shingled, for example, stationary or built-up scaffolding is recommended. Spruce is a first-class wood to use for this because it is tough-fibered and will bend without breaking. Suitable boards can generally be rented from a lumber yard for a small sum, the undamaged wood being returned after the work is done. Any cut or broken lumber will, of course, have to be paid for.

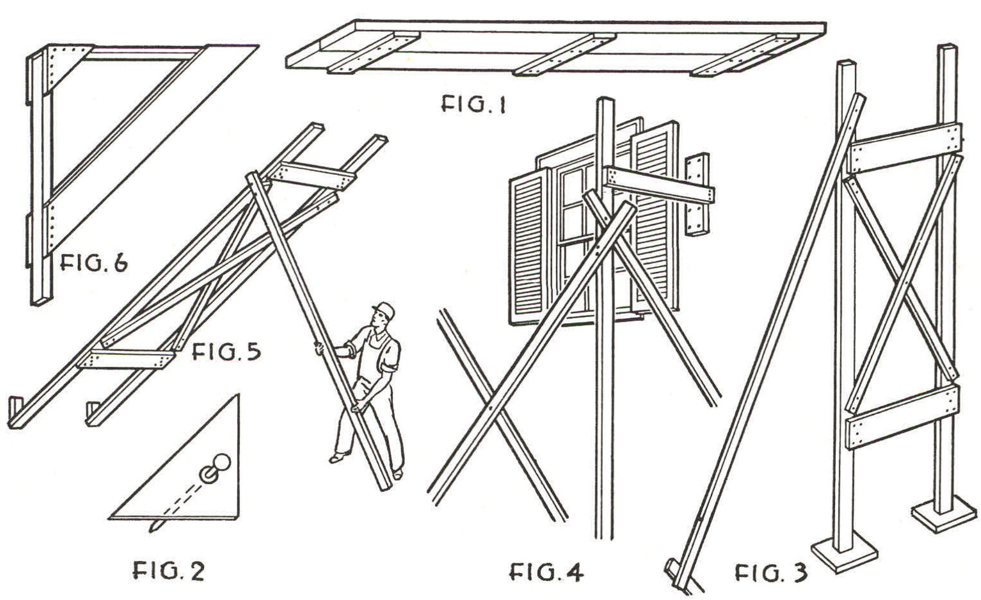
The uprights are 2″ by 4″ lumber, and the crosspieces upon which the planks rest, commonly known as ledger boards, are $1\frac{1}{4}$″ by 7″ lumber. Upright bracing is 1″ by 3″ stock. Planks are 2″ by 9″ hard pine. For more foot room and greater safety, use two planks side by side and cleated underneath, as in Fig. 1.

For nailing, use regular double-headed staging nails, as shown in Fig. 2. If these cannot be obtained, ordinary No. 10 nails will do, provided you leave the heads sticking out $\frac{1}{4}$″ or so for easy removal when dismantling the structure. The 1″ by 3″ braces are nailed to the uprights and to stakes driven in the ground. Wherever the braces cross each other, a nail is driven through to prevent them from jiggling back and forth, and to make the scaffold a much stronger unit. Ledger boards, which the planks will rest upon, are secured to the uprights with not less than five nails at each point of nailing, as in Fig. 3. On soft ground the uprights are prevented from sinking into the earth by means of short squares of board, as shown. Double uprights should be not more than 12′ apart, since a greater distance allows too much spring to the planks.

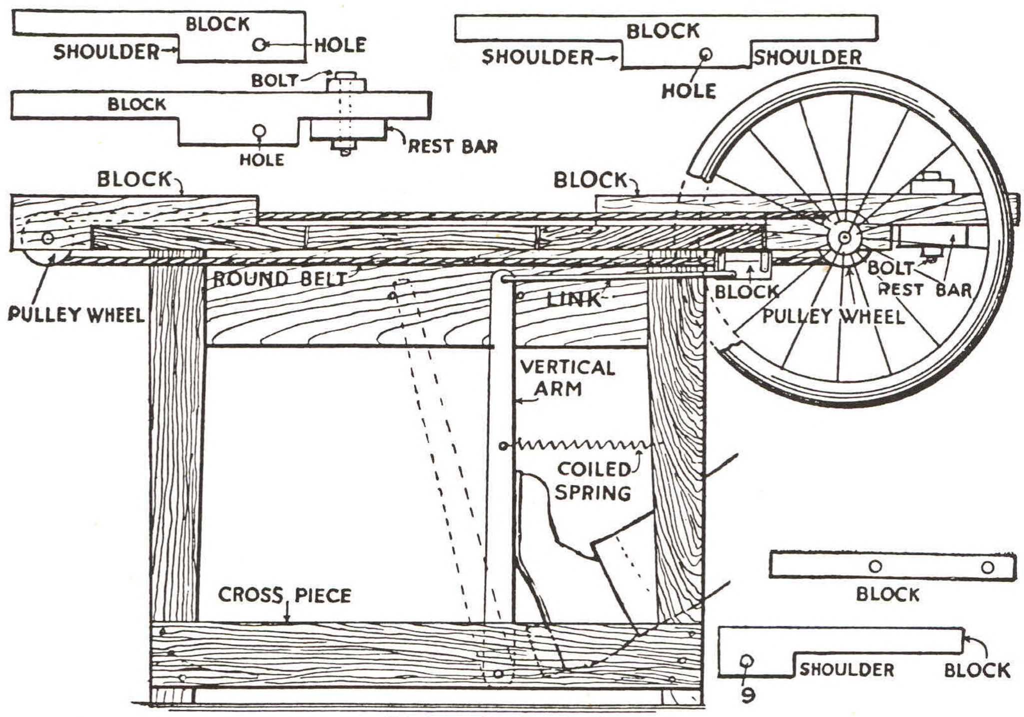
The 2″ by 4″ uprights should be not less than 3′ above the highest plank on the staging. At this level, a 2″ by 3″ guard rail should be nailed on horizontally, as shown in a drawing on the facing page. This is important, as it takes very little to throw a person off balance when working above the ground. A built-up scaffold, with double uprights connected by ledger boards, is good because it does not require fastening ledger boards directly to the house. However, Fig. 4 shows how single uprights can be used by nailing the inner end of the ledger boards to vertical supporting boards nailed to the shingles. When working alone on a hard surface where stakes cannot be driven into the ground, you can erect the uprights by bracing them against a couple of big rocks. Otherwise, use stakes as in Fig. 5.

Another type of scaffolding, using the push brackets of Fig. 6, is shown in the lower corner of the opposite page. This is easy to erect and is especially adapted for use where work is to be done at just one particular spot on the house or barn.

BUILDING WORKING STRUCTURES FOR MAINTENANCE JOBS



Making a Wood-Turning Lathe



The Illustration Tells the Story of the Metamorphosis of an Old Discarded Kitchen Table Into a Piece of Machinery for Practical Mechanics

IN the corner was an old kitchen table. That was the only thing handy to be used as the framework in making a wood-turning lathe. A block of spruce 2 ins. thick, 3 ins. wide, and 15 ins. long was first prepared. This had one end thinned down for a distance of 6 ins., and the other end treated in like manner 4 ins. to a shoulder, thus leaving a part 2 ins. thick in the middle portion, through which was bored a cross hole with a three-eighth bit, 3 ins. from the shoulder. A slot 1 in. wide was then cut through the block, extending in 7 inches.

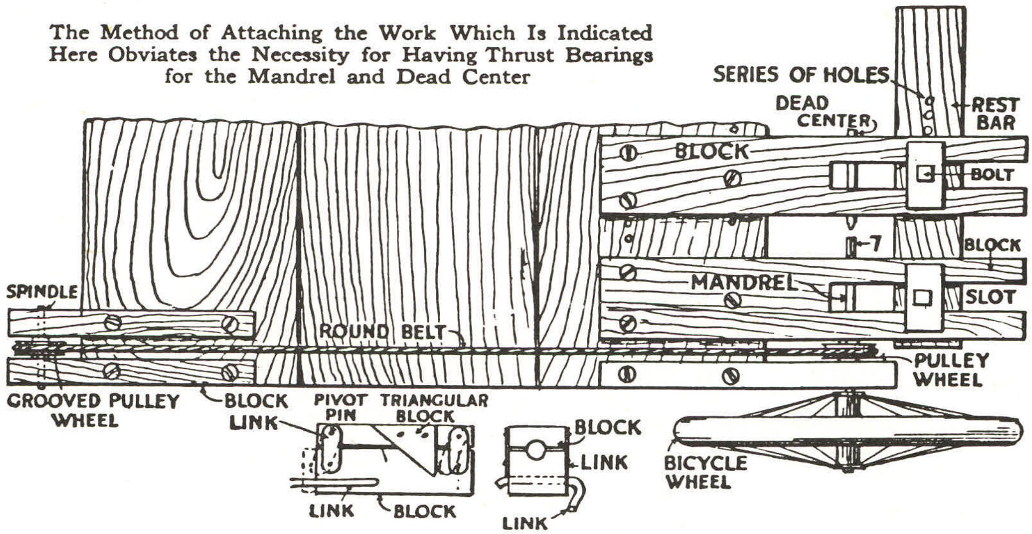
Another block 2 ins. thick, 1½ ins. wide, and 11 ins. long, had one end thinned down to correspond with the thinned portion of the first block, and a hole bored through to register with the hole in the first block.

These two blocks are screwed to the table top at its corner, and the holes are in line with each other to receive the mandrel. Obtain 2 pcs. of round three-eighth steel, one 12 ins. and the other 4 ins. long. Also obtain a couple of V-grooved pulleys. A bicycle repairer can fasten them to the mandrel and spindle. One of them was secured to the mandrel 5½ ins. from the end, and the other was fixed to the spindle midway between its ends.

One end of the mandrel thus made was filed square, and the other end of the mandrel carried the bicycle wheel which was easily attached. Two blocks were then made, each of 2 by 2-in. material, 10 ins. long. The lower side of each was then thinned back a distance of 6 ins. from one end to the shoulder and a cross hole with a three-eighth bit bored through the thick part of each block, so they registered. These blocks thus served as bearings for the spindle, so the wheel was located at the rear edge of the table, directly in line with the wheel on the spindle at the front edge of the table.

To impart motion to the mandrel, a hardwood block was cut out, 2 ins. long,

The Method of Attaching the Work Which Is Indicated Here Obviates the Necessity for Having Thrust Bearings for the Mandrel and Dead Center



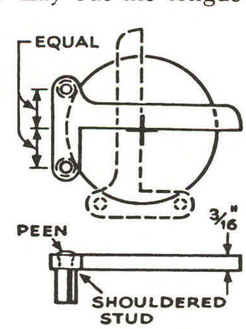
¾ in. thick, and ⅞ in. wide. A ¼-in. hole was bored through this from end to end above the center or middle line. A pair of links of thin metal on each side were attached by pivot pins at the ends to the sides of the block, and afterwards one end of each link was detached and the block sawed through along the bore, after which the block was placed on the round belt, which connected the two grooved pulleys, and the ends of the links again attached.

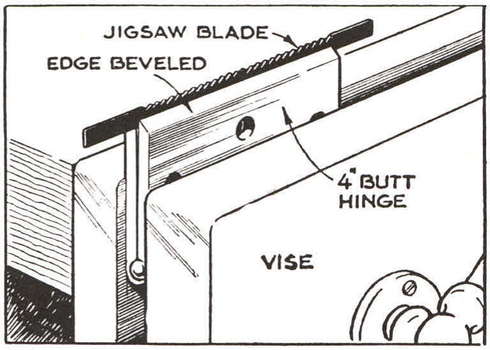
By this arrangement the two parts of the block move back and forth a limited distance independently of each other, and in doing so clamp the belt between them. A triangularly-formed stop was attached to the upper member of the block, so that one edge projected down alongside one of the links, and thus limited the movements of the blocks relative to each other. The dotted lines show the swing of the links when the lower part of the block is drawn to the left.

To move the lower part of this block to the left, and thus grip the belt, attach a cross-piece by nailing to the lower ends of the table legs. The upper end of this arm is connected with the block by a link which is made of ⅛-in. telegraph wire. A coiled spring with one end attached to the arm and the other to the table leg, serves to draw the upper end of the arm back, when it is released by the foot.

The dead center was fixed to a block similar in all respects to the first block and is secured to the top of the table by screws so it can be moved to and from the block. A rest bar with a series of holes was adjustably attached to the lower sides of the blocks by bolts so it might be moved to or from the lathe centers. The square end of the mandrel, if driven into a round 5/16-in.-hole in the end of the piece to be turned, holds it firmly, and this method of attaching the work obviates the necessity of having thrust bearings for the mandrel and dead center.—J. S. ZERBE.

Square Finds Centers. Pocket-size and accurate, this center square is made of flat steel and drill rod. Lay out the tongue exactly midway between the studs and at 90 deg. to their centerline. Take care to turn truly concentric shoulders on the studs. As with other finders, intersection of lines about 90 deg. apart is the center.—*Federico Strasser. Santiago, Chile.*





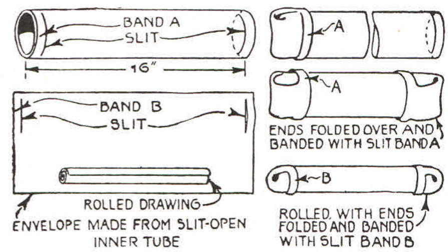
Jigsaw-Blade Vise from Butt Hinge

JIGSAW blades may be sharpened in a vise made from a 4" butt hinge. Bevel the edges of the hinge as indicated in the drawing above. Any small bench vise gives the necessary pressure to the hinge.—H. C.

No Cement Used in Making This Waterproof Rubber Envelope

FOR three years I have used in the locker of my car a waterproof envelope for my license and papers made from an old inner tube without the use of cement.

Use a fairly good tube and cut slits as shown in the upper left-hand sketch. Then



A pouch for papers and a roll for drawings

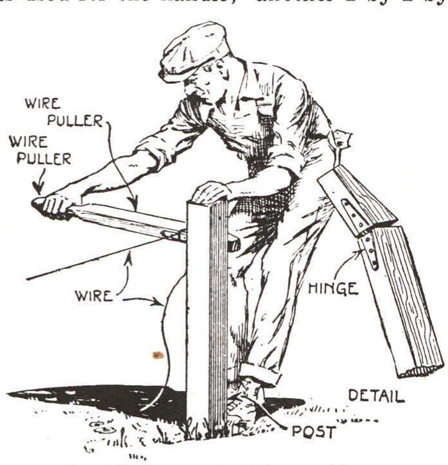
fold as shown in the two upper right-hand drawings. To make a roll for drawings, cut slits in a tube that has been opened from end to end and fold as shown in the lower sketches.

The now time-honored use of inner tubes for re-soling and -heeling rubber shoes is another idea well worth while, for if the rubber is applied with two coats of cement, the soles and heels will wear like iron.—W. W. PARRY.

Stretching Wire with a Homemade Tool

BELOW is shown a simple homemade wire-stretcher of two pieces, which form a lever by being connected with a strap hinge.

A piece of strong wood 2 by 2 in. by 4 ft. is used for the handle; another 2 by 2 by



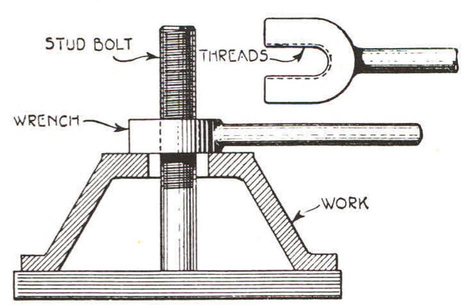
Little skill is required for making one of these effective wire-stretchers

8 in. for the short part. Each part is metal-capped at the juncture.

The wire is caught between the two sections and with the short part braced against the post, the lever end draws the wire taut.—CHARLES A. BLACK, JR.

Making a Clamping-Wrench for the Shop

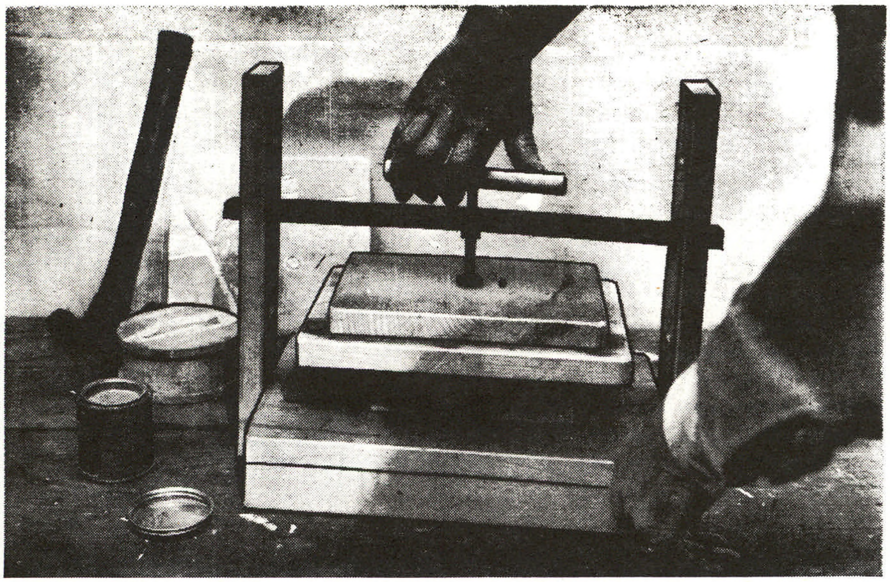
IN shop work it often becomes necessary to fasten a piece of work around a long arbor in such a manner that it may be removed or its position changed quickly. Then a clamping-wrench as illustrated will be found extremely useful. The wrench-nut will slip into the threads of the clamping-

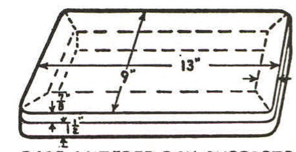


A clamping-wrench that will slip into the threads of the stud at any point and can be tightened or released by a quarter-turn

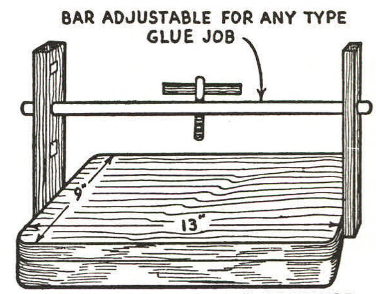
stud anywhere within one quarter of a turn from tight, and upon loosening will come off easily.

To make a wrench-nut, suspend a tap on centers in the lathe, clamp the nut to compound rest, set the lead, and use the tap as a hob.—R. F POHLE.





BASE MITERED BOX SUPPORTS 7/8" FLOOR



ASSEMBLED CLAMP LESS PRESSURE BLOCK

Make Your Own Glue Clamp

By DICK HUTCHINSON

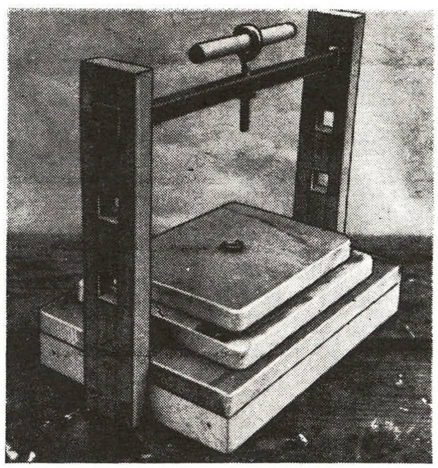
ILLUSTRATED here is a very practical glue clamp that can easily be made right in your own home workshop with very little effort. By salvaging most of the materials from the scrap heap, it will cost practically nothing. The only item that had to be purchased to complete the clamp shown was the 3/8" eyebolt.

This clamp is constructed in such a manner as to allow the clamp bar to be shifted from one stop to another to accommodate almost any size glue job, and too, this saves a lot of time in that the bolt does not have to be run down so far before exerting pressure.

The base is made up of pine. The floor is a piece of 7/8" board reinforced on the underside with a box composed of 1½ x 2" strips which are mitered at the corners, and the whole is nailed securely to the floor.

The columns, or posts are of 7/8" clear maple. 1" square holes are cut to receive the 3/4" square steel bar. To cut these square holes, a small hole is drilled in each of the four corners of the square, and the block is sawed out with a coping saw. Three holes are drilled through, and counter sunk in the lower end of each of the posts, and the posts are attached to the base with 1¾" No. 7 F. H. wood screws.

The clamp bar is of 3/4" square steel bar stock. A 3/8" hole is drilled through the center to receive the eyebolt. The 3/8" square nut is soldered to the underside of the bar, and the eyebolt fitted with the



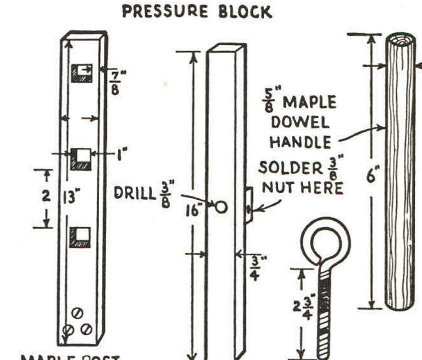
dowel handle is inserted, and run down as desired.

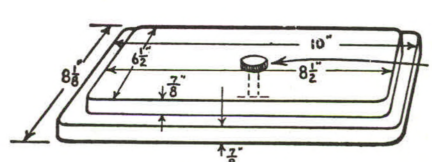
The pressure block is made up from two pieces of 7/8" pine. These are assembled cross grain to prevent warping, and are nailed together.

The bearing to receive the bearing end of the eyebolt is a special hollow head set screw. A hole is drilled through the center of the pressure block, and is countersunk on the underside, the screw is set in, a nut is placed on the end of the screw, and turned in flush with the bottom surface of the block.

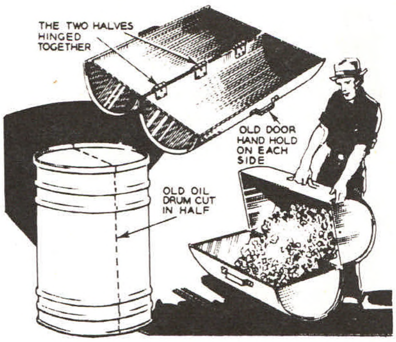
The finished clamp, as the photographs show, looks like quite an elaborate piece but it is just as efficient as any clamp ever made or devised.

PRESSURE BLOCK





HOLLOW HEAD SET SCREW FOR PRESSURE BEARING

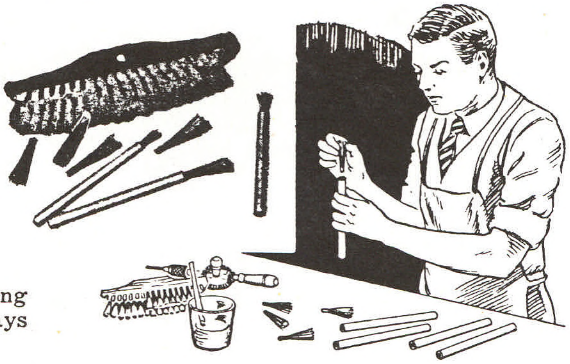


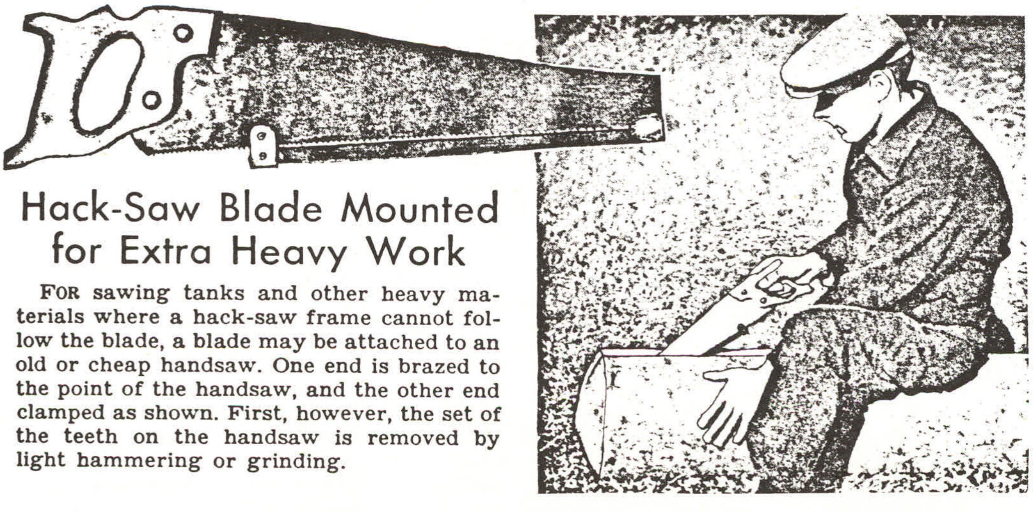
Oil Drum Used As Home Concrete Mixer

WHERE small repair jobs are to be done about the home and concrete mixing is necessary this simple mixer will prove its value in a few minutes. Secure an empty oil drum and cut it through the center. The two halves are then hinged together and a handle attached to each of the open sides. To mix the concrete, place the sand, cement and water in one side and mix lightly with a rake. To complete the mixing raise the half of the drum so that the concrete is poured into the other part of the drum.—A. H. Waychoff, Tempe, Arizona.

Handy Brushes for Gluing and Touch-Up Jobs

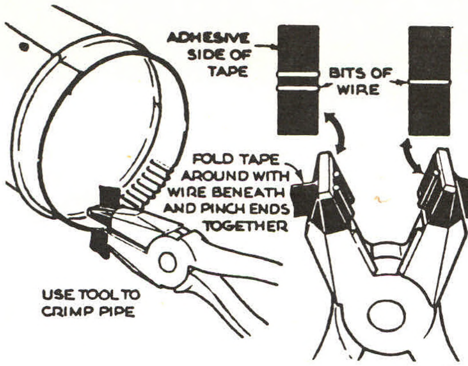
SMALL brushes for touch-up jobs or applying glue or soldering acid may be made from tufts of bristles taken from an old clothes or shoe brush. Glue them into holes drilled in short lengths of dowels. Use casein glue, which is waterproof when dry; the brushes will then resist alcohol, turpentine, and even mild acid. They are so cheap and easy to make that they may be discarded after being used. This saves time in the long run because it does away with the always messy job of cleaning.—W. C.





Hack-Saw Blade Mounted for Extra Heavy Work

FOR sawing tanks and other heavy materials where a hack-saw frame cannot follow the blade, a blade may be attached to an old or cheap handsaw. One end is brazed to the point of the handsaw, and the other end clamped as shown. First, however, the set of the teeth on the handsaw is removed by light hammering or grinding.

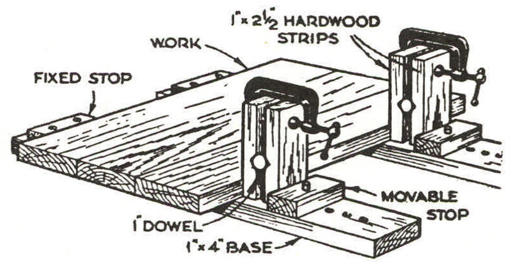


Pliers Serve as Crimping Tool

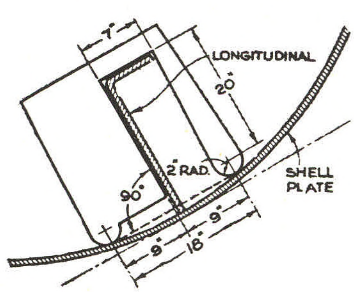
SAVE your fingers when coupling stovepipe or light-gauge ducts by using this homemade tool. Capable of crimping sheet metal as thick as .064", it can be improvised from a pair of ordinary mechanics' pliers, a few finishing brads, and adhesive tape. Cut the brads—wire would serve as well—into ⅜" lengths and stick them to a strip of the tape as shown in the sketch at the left. Then wrap the tape and cut brads around the jaws of the pliers.—WILLIAM C. FURMAN.

Gluing Jig for Large Work Utilizes Two Small C-Clamps

TWO small C-clamps are used in this jig to hold together a large glued assembly while it is setting. The clamps force together the heads of pairs of hardwood strips that are separated by 1" dowels. One foot of each pair presses against an adjustable stop that is held in place by a bolt or short rod set through it into a base. The foot of the other strip pushes against the work, which is held at its opposite edge by fixed stops. The dowels may be moved up or down to vary the leverage.—RONALD EYRICH.



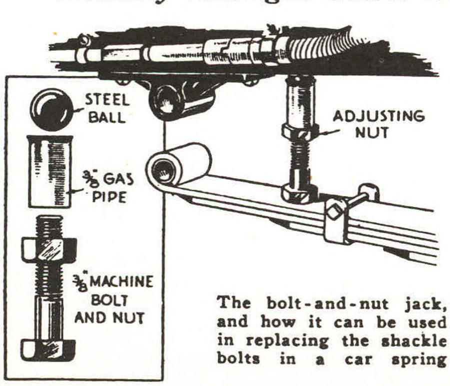
Gauge for Setting Members Vertical to the Chord of a Curve



CLAY DYER, a loftsman at the Marinship Corporation, Sausalito, Calif., designed this gauge as a device for quickly setting longitudinals at right angles to curved shell plating. With the former method it was frequently necessary to scarf and reset various longitudinals when they failed to meet the connecting brackets properly.

While this gauge was primarily designed for use in the shipbuilding industry, it could be adapted for use in other structures—such as tanks or silos—where a member must be aligned vertical to the chord of a curved surface.

Handy Midget Jack Made From Bolt and Nut



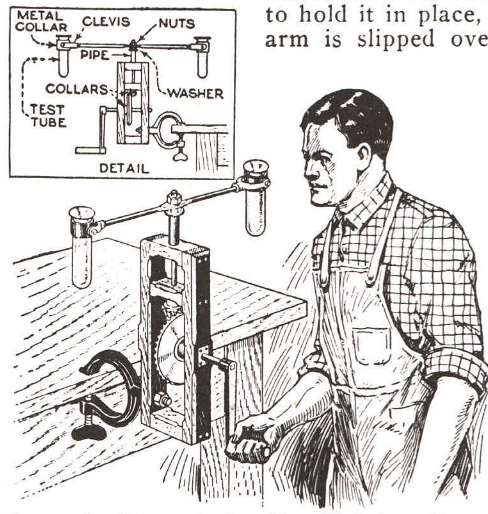
The bolt-and-nut jack, and how it can be used in replacing the shackle bolts in a car spring

FROM an ordinary machine bolt and nut, a scrap of gas pipe, and a steel ball bearing, the amateur mechanic can provide himself with a powerful midget jack that will prove valuable for many types of repair jobs. As shown in the drawing, the jack is assembled by slipping the pipe over the end of the bolt and placing the ball bearing in the upper end of the pipe. To adjust the jack, it is necessary only to turn the nut with a wrench. A considerable amount of lifting power is obtained.—F. C.

Homemade Centrifuge for Farmers

By L. B. ROBBINS

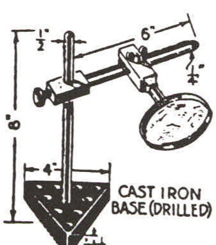
EVERY farmer knows that the fat content of milk can be determined accurately and quickly by means of a "whirler" or centrifuge of the kind shown in the drawing. However, the cost of a manufactured machine often keeps the dairyman from using one, and this has led one farmer to design and construct a simple centrifuge at home. The device is made from old machine parts that were picked up around the farm workshop. It consists of a rectangular wooden frame, holding a horizontal and a vertical shaft, each with a bevel gear mounted on it as shown, a whirling arm, hand crank and two test tubes. The frame is built about 12 in. high and 3 in. wide, of 1-in. hardwood stock about 1 or 2 in. wide. The long pieces are screwed to the ends of the short ones, and may be braced with angle irons, if desired. Two bearing holes are drilled through the sides, to take the horizontal shaft on which the large bevel gear is mounted, and bushed with short lengths of brass tubing. A hand crank is attached to one end, and two washers and a collar are used to keep the gear in close mesh with the smaller one on the vertical shaft; this shaft is similarly mounted in two holes, drilled through the crosspieces and bushed. The shafts and bevel gears of an old ice-cream freezer were found satisfactory for this purpose. The whirling arm can be made from a 12-in. length of ⅜-in. round steel rod, flattened and drilled in the center to fit the vertical shaft. A pipe nipple, washer and nut are fitted on the upper end of the shaft to hold it in place, and after the whirling arm is slipped over the end, the nut is screwed on tightly. On the threaded ends of the whirling arm two Ford brake-rod clevises are attached, and a short piece of thin metal tubing is mounted loosely inside of each clevis, by means of pins soldered to the sides, to permit it to swing freely without binding. The tubing should just be large enough to receive a glass test tube as indicated. An old washing-machine or wringer clamp can be fastened to the frame so that it can be attached to a bench or table. In use, the test tubes are filled about three-fourths full of milk, set in the tube holders on the whirling arm and the hand crank is then operated at a high rate of speed; this will cause the bottom end of the test tubes to swing outward due to centrifugal force. All solids in the milk go to the bottom, and this makes it comparatively easy to determine the fat content accurately; the device also allows the test to be made much more quickly than by any other method.



Inexpensive Homemade Centrifuge Made by a Farmer to Determine the Fat Content of Milk

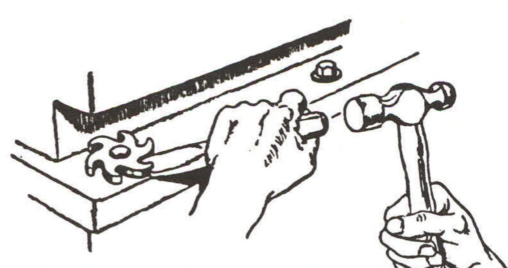
Adjustable Stand for Holding Shop Magnifying Glass

IN THE tool room a large magnifying glass has many uses and even for laying out ordinary work at the bench it is to be preferred to a smaller magnifier. The only drawback is the possibility that the expensive glass may be broken through careless handling. This difficulty can be met, however, by providing a stand for the glass as illustrated.



A large magnifier mounted for shop use

A stand of this type has stood for several years on one toolmaker's bench, and surprisingly many uses are found for the glass in the course of a day's work.—H. L.

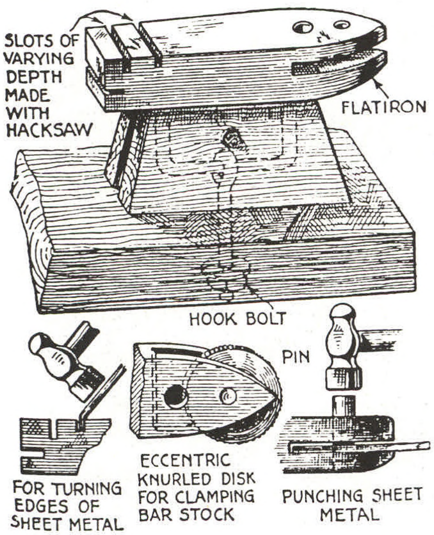


A Drive Wrench for Close Quarters

THERE are countless different types of wrenches on the market, yet a new style or idea develops every now and then. Recently the writer made up a set of six standard-size wrenches of the type shown, as well as a notched drift to drive them. These wrenches can be used where a nut is hard to get at and are particularly useful for starting stubborn nuts.—CHARLES WILLEY.

Flatiron as Useful Bench Fixture and Anvil

THE home worker can provide himself with a serviceable anvil and bench fixture for light work by rigging up a heavy flatiron as illustrated. It is mounted be-



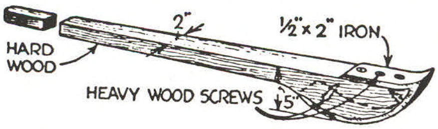
Slotted, drilled, and mounted, a flatiron serves for much light metalwork

tween two blocks and fastened to the bench by means of a hook bolt fastened around the handle and drawn tight from beneath.

Slots of various depths can be cut in the top surface and at one end to serve for turning the edges of sheet metal, and the point can be used as a punching fixture for clamping bar stock, and the like.—G. A.

A Safe Lifting Bar for Use in Shop or Shipping Room

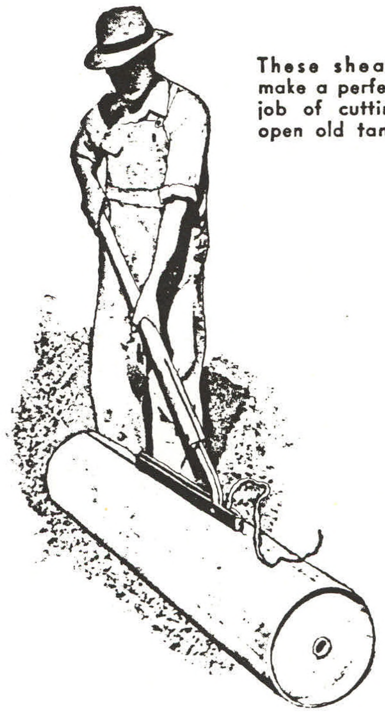
IT IS possible both to simplify and make more safe the moving of heavy parts around the shop or shipping room through



A heavy lifting bar of this type often serves better than ordinary crowbars and blocking

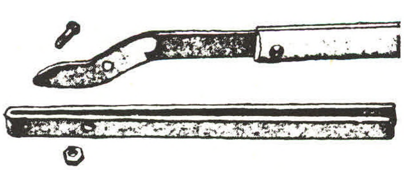
the use of a lifting bar of hardwood with an iron shoe fitted on the end. This takes the place of a crow bar and loose blocking, which are apt to slip.

Big "Can Opener" Cuts Sheet-Metal Tanks



These shears make a perfect job of cutting open old tanks

OLD hot-water tanks and other discarded sheet-metal tanks are used for innumerable purposes, many of which require them to be cut open. If much of this work has to be done, it pays to have a blacksmith make a big "can opener" or heavy pair of shears from lightweight automobile springs as shown. To provide clearance for the waste strip cut out by the shears, it is necessary to spread the top edges of the U-shaped piece apart slightly. The cutting edges of both pieces are ground flat. One corner of the tank has to be cut with a hack saw so the shears may be inserted.



The cutting parts before being assembled

Ball-Bearing Tester Checks Bent Shafts

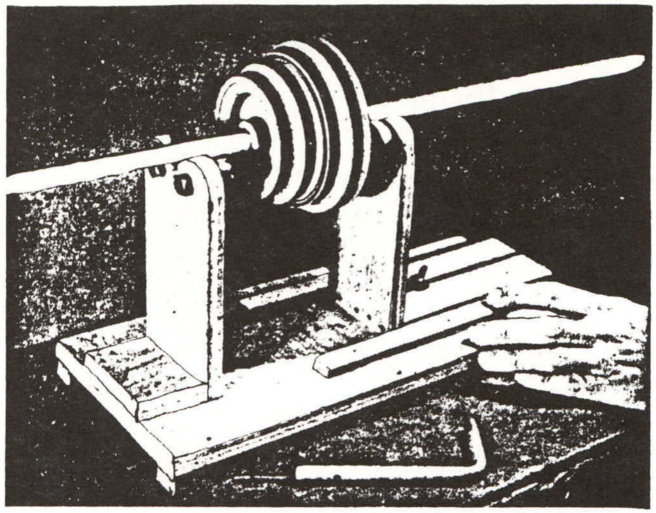
FOUR ball bearings, five bolts with nuts and washers, and some scrap lumber will provide you with a tester to try the trueness of electric-motor shafts and similar parts. With no more equipment you can also check pulley wheels, armatures, and the like for rough static balancing. The addition of a knife-edge rim to each bearing will increase by a good deal the sensitivity of the static-balance test.

Ball bearings of the sealed type are preferable. They must be free running, so use very light oil when you lubricate them. Mount them on two uprights, as shown, spacing each pair so their faces will not quite touch. The bearings in the photos are 1¼" in diameter and have a ⅜" face and ½" hole. If you use ¼" mounting bolts, they will allow for lateral adjustment. A washer between each bearing and the wood will permit enough clearance for free rotation.

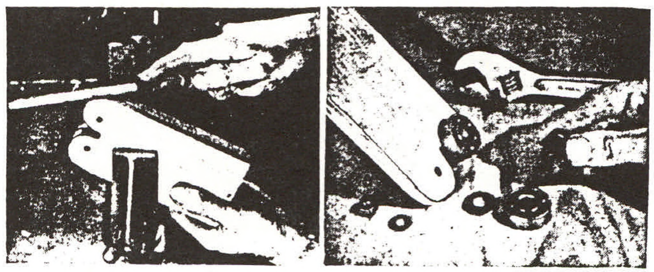
130

The uprights shown are ½" by 3" by 6¼" plywood. One is mounted permanently on a 6½" by 14" base. The other is attached to a ½" by 3" by 6" strip slotted 5/16" for most of its length and sliding between two guide strips. A ¼" bolt and wing nut lock it in place.

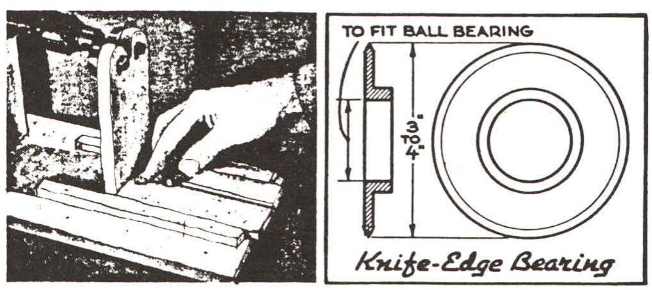
For sensitive static balancing, make the knife-edge rims as indicated in the drawing, using steel that can be hardened. The holes should be in the exact center and a press fit for the bearings, which will have to be respaced to suit the rims.—W. E. B.



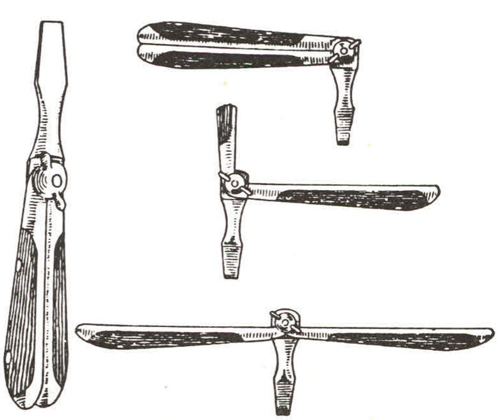
Rotated while its shaft rests on two pairs of ball bearings, an armature, pulley, or the like can be tested quickly for trueness.



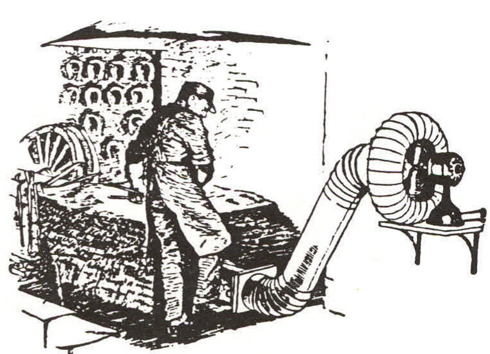
The two ½" plywood uprights are temporarily fastened and finished as one piece. Bearings are held to them with ¼" carriage bolts.



One upright is adjustable in a slot for different shaft lengths. The drawing shows a knife-edge bearing to help static balancing.



A Novelty in Screwdrivers

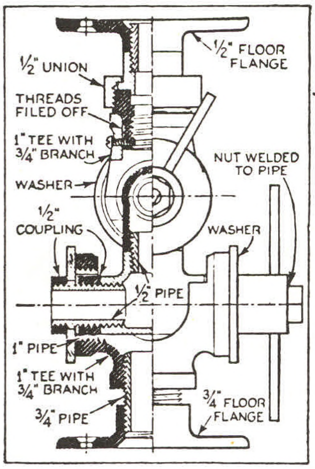


Universal Tilting Shop Stand

ASSEMBLED FROM PIPE FITTINGS

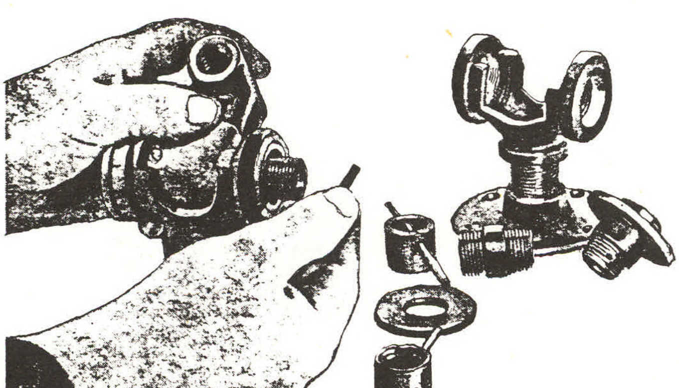
The stand is useful for soldering and it can be used as a base for a drill-press vise. Left, how the parts are assembled

AN EXTREMELY rigid shop stand, which can be tilted and swiveled to any angle, can be made from a few pipe fittings.

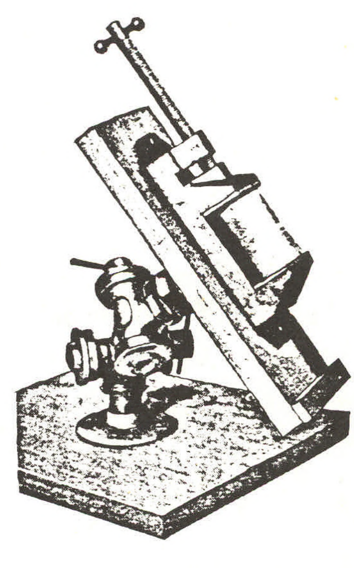


Screw short lengths of pipe into the ends of two 1" pipe tees and cut the pipes off flush with the ends of the tees. Cut away the central part of the 1" tees so that ½" tees can be slipped into the larger tees as shown. To form a bearing for the ½" tees, screw a short pipe, with a narrow piece of coupling on it, into each end of the ½" tees. If necessary, file down the outside of the couplings so they will turn freely in the 1" pipes in the large tees. Lock the pipes in the ½" tees with pins or machine screws. Slip large washers over the outer ends of the ½" pipes and screw sections of couplings up against these. At one end of the tees, screw the coupling and washer up tight against the inside coupling. Let the coupling on the other end overhang the pipe, drill a hole through the coupling, and insert a rod for a handle. If the stand is to be used for heavy work, weld a nut to the coupling as shown so the stand can be tightened with a wrench instead of the crossbars.

Fasten a ½" pipe union in the branch of one of the 1" tees so the top of the stand can be swiveled, and screw short nipples and floor flanges on the top of the union and the branch of the other 1" tee.—MERLE TERRILL



Bearings for the ½" tees are formed from short pieces of pipe and narrow pieces of coupling. Right, stand with drill vise



WHEN polishing with an emery cloth, the holder shown in Fig. 1 is more satisfactory than a flat file.

The cloth is cut the right width and the ends are folded and slipped into the diagonal slots. The abrasive is then tightened by screwing the windnut.—G. A. L.

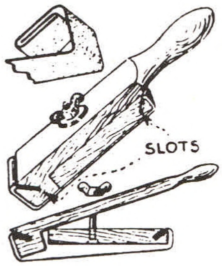
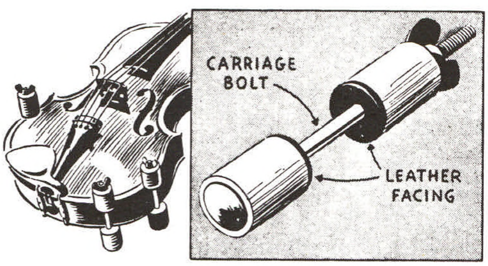


Fig. 1. Emery cloth holder

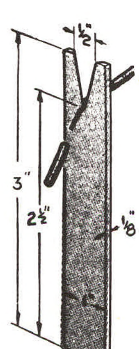


Dowels on Bolts Clamp Violin

STANDARD ¼" carriage bolts and wing nuts used with hardwood-dowel jaws drilled for a sliding fit make clamps for holding violin bellies and backs in place. A leather facing glued to each jaw will prevent marring of the varnish.—RICHARD P. MILBURN.

Pocket Wire Stripper Fits on Key Ring

FOR an efficient wire stripper, hacksaw a notch in a piece of ⅛" steel of the dimensions shown at right and file a bevel on one side. To strip stranded wire, drill a hole the wire size and cut the notch to it. A hole at the other end will permit attachment on the key ring. —DAVID B. CLAPP.



Wristpin Bushing Tool for Rapid Work

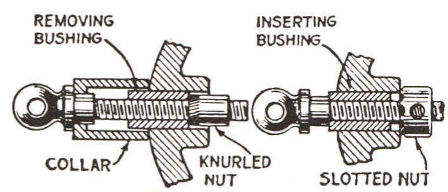
Useful both for insertion and removal

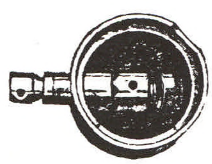
By Harvey Mead

THIS tool for inserting and removing wristpin bushings has given very good service and is easy to make. The dimensions can be made to suit the work.

The inside diameter of the collar must be just a little larger than the outside diameter of the bushing. The knurled nut has an outside diameter slightly smaller than the outside diameter of the bushing.

To insert a bushing, place it over the screw, locate the toothed or slotted nut between the bosses in the piston with the milled slots against the boss, and with a bar as a lever, turn up the screw until the bushing is in place.





How the wristpin bushing tool is made and used. The photograph at the left shows the insertion of a bushing; that above, its removal

To remove a bushing, place the collar, open end last, over the screw. Pass the screw through the bushing and start it into the knurled nut. Let the open end of the collar bear against the piston and tighten the screw.

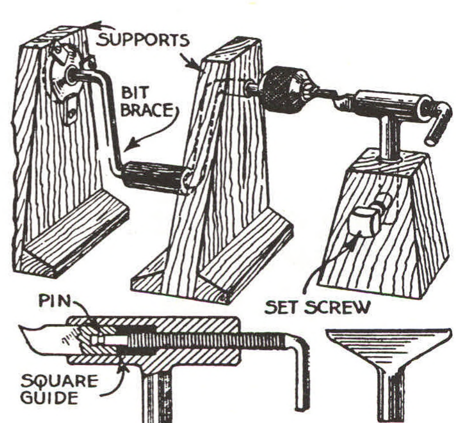
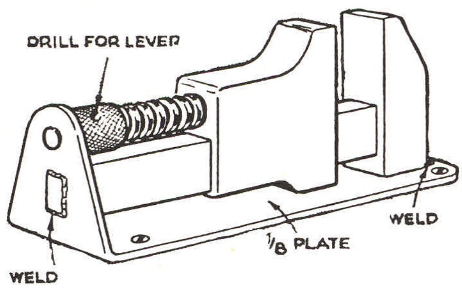


Fig. 4. Bit brace for turning

Vise Made from Monkey Wrench

ITS handle discarded, a monkey wrench can be welded to a bent steel plate to make a small bench vise. Bolted or screwed to the bench, the vise is useful for holding small jobs for filing and other operations. It is also handy in hard-soldering and brazing, saving the regular vise from exposure to intense heat. Weld the fixed jaw and the end of the shank to the plate, as shown below. A removable lever in the screw aids tightening.—ROLLA J. SMITH.



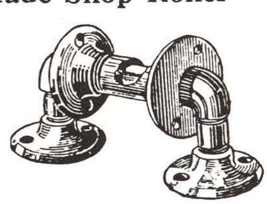
Handle for Sheet Metal

THE difficult and often dangerous job of handling large sheets of metal may be made easy and safe by the holder illustrated. It is simply a loop of 5/8-in. steel rod just large enough to fit a man's hand, and with about 3 in. at one end turned back near the loop, leaving a space large enough to admit the metal. The turned-back portion is drawn down to a wedge shape at the end.—JOSEPH C. COYLE.

Top sheets are easily moved with this tool.

Cheaply Made Shop Roller

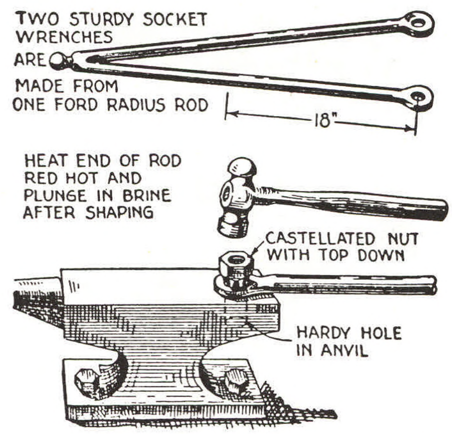
WITH only standard pipe fittings, a durable and efficient roller can be made for handling heavy and bulky pieces of lumber and steel. It has been used in handling lumber going to and from the saws; for steel bars, for fire hose, and for many other shop purposes.—W. T. M.



Large Wrenches from Discarded Ford Radius Rods

RUGGED and substantial wrenches for tightening or loosening the nuts holding spring clips and automobile wheels may be made in a repair shop—where many of them are required—out of bent and broken front radius rods from Ford cars.

An 18-in. section of the radius rod, with the eye at the end, is cut off and the end is



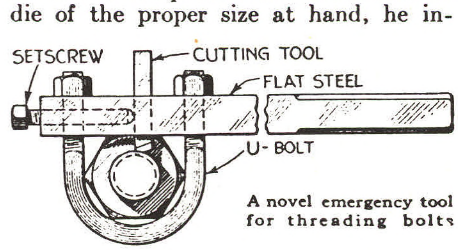
Powerful tools for heavy work are quickly forged from old auto parts

heated red. The castellated head of a nut is started in the eye after the red hot end of the rod has been placed over the hardy hole in the anvil, and the whole nut is driven through. While still hot the end is plunged into brine.

The whole process of converting a radius rod into a wrench of this type takes less than ten minutes, and the resulting tool stands up under the hardest usage.—F.A.Y

Improvised Threading Die

WHEN an erector was faced with the necessity of cutting longer threads on some foundation bolts already in place for an air compressor and could find no die of the proper size at hand, he in-

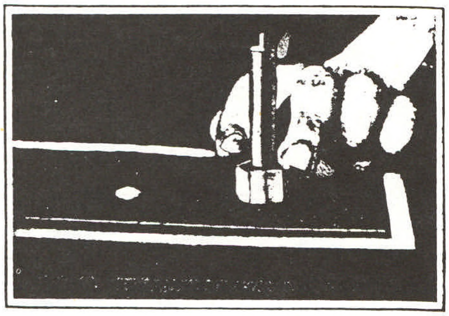


A novel emergency tool for threading bolts

geniously made the tool illustrated. It consists of a nut to give the proper lead, a flat bar of steel with a setscrew to hold a threading tool at one side of the nut, and a U-bolt for fastening the bar to the nut.—FRANK N. COAKLEY.

Self-Centering Punch for Use with Templates

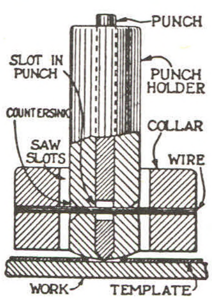
WHEN a sheet iron template is used for laying out work, it is common practice to scratch around the hole and then find the center with dividers. A self-locating center punch that saves this work by automatically finding the center of the holes, is illustrated below. The construction and operation



When the collar is pressed down, the punch automatically centers itself over the hole

of the tool is made clear in the drawing.

The punch holder is rounded on the end, and tends to center itself over the hole in the template. The collar insures that the punch holder will be held perpendicularly over the hole. The wire spring passing through collar and holder forces the holder to enter the hole when the collar is pressed down, as shown in the photographic illustration. The saw slots and the countersink are merely to give some clearance for the bending of the wire.

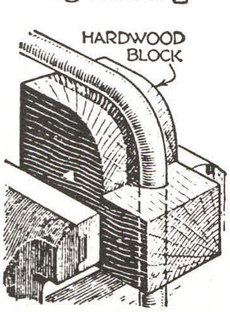


How punch, holder and collar are made

For severe service all parts should be of tool steel, hardened.—H. MOORE.

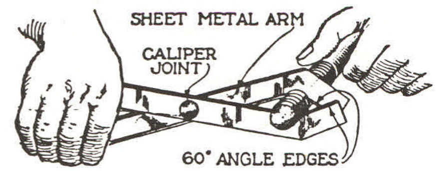
Block for Bending Tubing

GARAGE men and others who have to bend brass or copper tubing will find the block shown an aid in turning out good-looking work. The hole is about 1/16 in. larger than the tube. The block can be held in a vise, or by hand.—H. L. W.



Makes neat bends

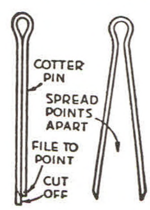
Thread Cleaning Tool



The threads to be scraped are gripped near the back, or inner, end and screwed outwards

WELL fitting screws will bind unless the threads are perfectly clean. When a screw thread is blocked up with small particles or hard grease, I use a scraper of my own manufacture. It consists of two arms cut from No. 10 gage sheet metal and riveted together with a caliper joint, as shown. The blades which inclose the thread are filed to a 60-degree angle and left rough so as to form many minute scraping edges.—H. MOORE.

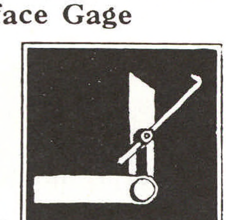
Tweezers Made from Cotter Pin

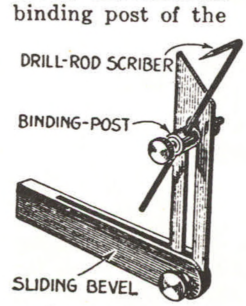


MINIATURE tweezers for handling small objects can be improvised from a cotter pin. Cut the legs even and spread them so they'll grasp the work. They have just enough natural spring.

Bevel Quickly Adapted to Serve as a Surface Gage

IF YOU require a surface gage in an emergency, you can improvise one with an ordinary bevel. An electrical binding post of the metal or telegraph type is attached to the slotted blade of the bevel, and a scriber made of drill rod is clamped in the binding post as illustrated. —W. J. E.



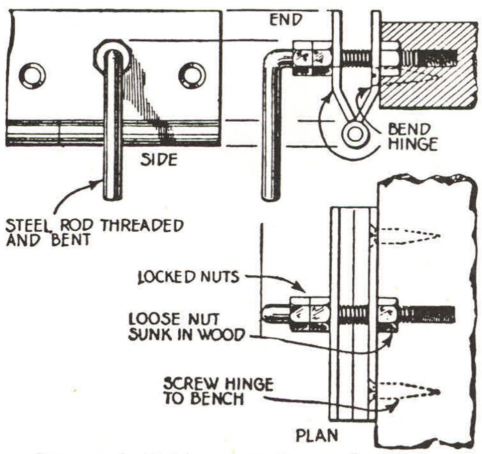


Improvised gage

A Butt-Hinge Serves as an Improvised Vise

SHOWN in the illustration is a small clamping-vise that can readily be made from a 4- or 5-in. butt-hinge, and is serviceable for holding electrical parts, pins, keys, etc., while filing or fitting.

The hinge is screwed to the edge of the bench or any projecting beam.

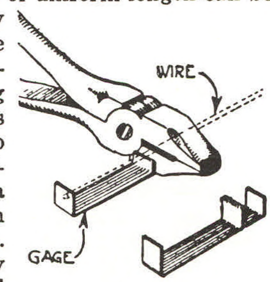


How a butt-hinge can be made into a serviceable clamp vise is illustrated here

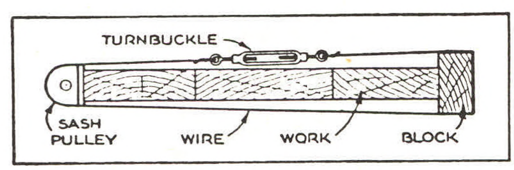
The edges are bent by inserting a piece of steel between them and hammering. A bent and threaded rod with three nuts is the means of closing the jaws. This fixture is made up in a few minutes and is serviceable for the odd light jobs about the automobile shop.—G. A. LUERS.

A Useful Gage for Cutting Short Lengths of Wire

SOMETIMES a number of short lengths of wire are required for certain work where only pieces of uniform length can be used. It is not easy to make accurate measurements because the cutting edges of the pliers are beveled. To overcome this difficulty, provide a simple gage such as is shown here. It s made of any heavy sheet metal and the double end is bent so that the strip will hold firmly on the pliers.—D. C.



Gage for pliers



Turnbuckle Adapted as Clamp

WHEN wide boards are to be edge glued, clamps can be improvised from turnbuckles, sash pulleys, and picture-frame wire. Mounted on one edge of the boards, the sash pulley assures uniform tension of the wire on each side of the work. A block of wood on the opposite edge prevents the wire from cutting.—F. E. AVERILL.

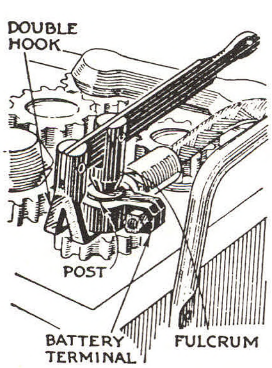
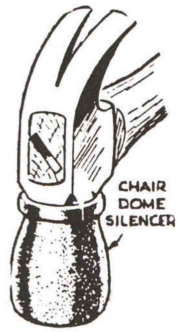


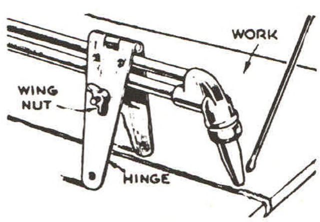
Fig. 3. Lever and hook device above is useful in removing corroded battery cable terminals

IF SHARPENED to three points with a center and two side cutters, a standard twist drill makes a perfect tool for drilling holes through light metal. Used with a hand brace, a 1″ drill will cut through 22-gauge metal, making a perfectly round 1″ hole. If several such drills of various sizes are sharpened, you should find them a useful addition to your tools.—CHRISTIAN LEONARD.

Soft Covering for Hammer Head

USE of a rubber dome silencer of the kind sometimes found on the feet of chairs will convert an ordinary claw hammer for work on materials easily marred. The silencers come in a size that fits large hammers of the home type, and one can be slipped readily over the striking surface.—DAVID B. CLAPP.



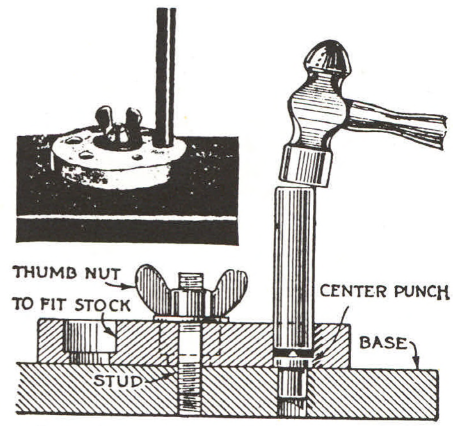


WELDING is done efficiently if the torch is clamped in an ordinary hinge, as shown above, so the nozzle can be kept a definite distance from the work. The simple device is especially helpful when it is necessary to weld a long seam neatly.—R. E.

Unique Centering Tool for Small Shafts

A UNIQUE method of centering round stock for turning in the lathe is shown in the photographic illustration, and the accompanying drawing gives the details.

The device consists of a base into which is fixed a hardened center punch and a clamping bolt for the disk. The disk has several holes to fit the common sizes of small shafts. Each of these holes is made



Over the center punch is mounted a disk with holes to take shafts of various sizes

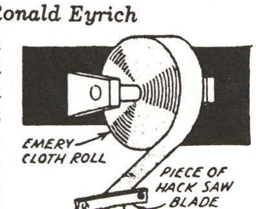
as shown on the left of the drawing, except one, which is as indicated at the right. The upper part of the hole fits the shaft; the remainder is the size of the upper part of the center punch in the base plate.

In use the disk is turned to bring the proper size hole over the center punch and then clamped by means of the wing nut and bolt in the central hole. The piece to be centered is inserted into the hole and struck with a hammer —H. MOORE.

EMERY CLOTH DISPENSER

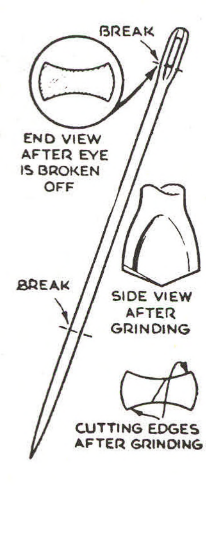
By Ronald Eyrich

Tearing off a required length of emery cloth from a roll is quickly accomplished if a support is made to mount the roll on the wall. A short piece of a discarded hack saw blade fastened to the wall beneath it serves as a tearing edge, and works very effectively.



Twist Drill Made From Needle

IF YOU break your last small twist drill when you are in the middle of a job, and if purchasing a new one is inconvenient, you can make a substitute from a small needle. Break off the point and the eye, as shown. Grind down the upper or head end of the remaining piece to form two cutting edges. Chuck the shank in a hand drill. The drill thus made will be found to have good side clearance.—CPL. JOSEPH A. DESBIENS.

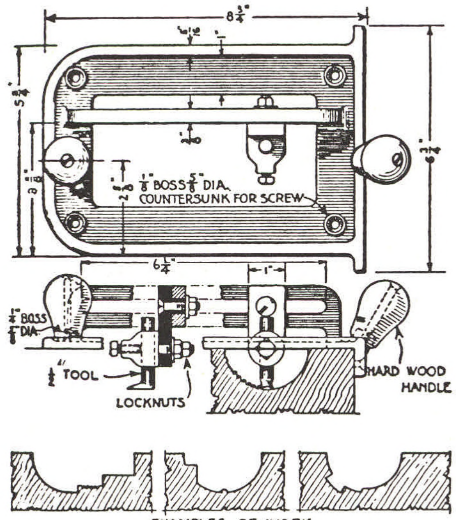


Core-Box Plane and Router for the Pattern Shop

By Henry S. Laraby

THIS core-box plane is an improvement on the old-fashioned right-angle type and has the additional advantage that it can be used as a router.

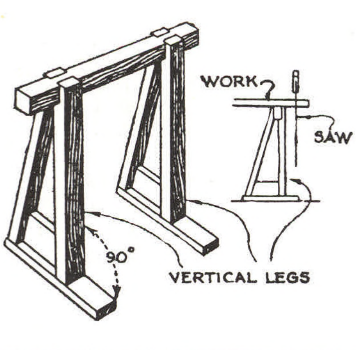
The frame should be made of cast iron or aluminum. With three knives of different lengths, any size of core-box from 1 in. to 5¼ in. can be worked out. Before the plane is used, the work is usually roughed out to within 1/16 in. of the finished size by means of a circular saw or gouges. A cutter



Handles many varieties of recessed planing

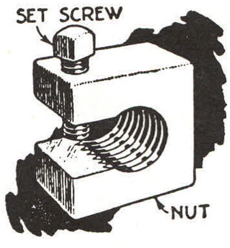
of the proper length is then fastened in the plane and it is run over the work, the knife swinging to the set radius. The frame provides a very good bearing and guide.

All kinds of forms are possible if the necessary knives are used. The plane can be used on irregularly shaped work by screwing strips of wood to the side of the work to guide the plane in following the desired shape. To my mind this is one of the handiest tools in the patternmaker's kit.



With two of its legs vertical instead of slanting, this sawhorse makes sawing easier.

C-Clamp Made from Large Nut

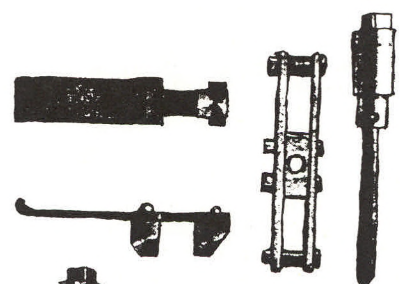


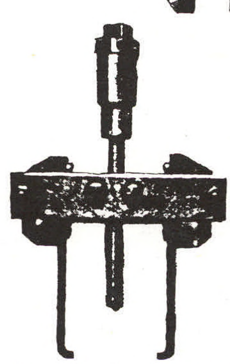
An easy way to make strong little clamps

RECENTLY I needed a small but very strong C-clamp to aid in doing a repair job. Picking out a ¾ in. square nut and a suitable set screw from the junk box, I sawed out one side of the nut as shown and drilled and tapped it to take the set screw. This kink should be useful to model makers, who rarely have a sufficient supply of small clamps.—S. A. Asquith.

Sturdy Gear Puller and Commutator Tool

EVERY mechanic wishes to have certain personal tools for the hard little jobs that come along. Among those I have made and found useful on many occasions is the gear puller illustrated. Its

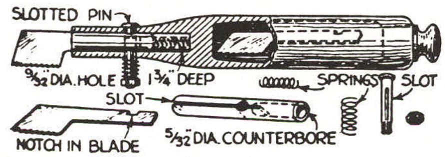




Gear puller of a wide range of usefulness

construction is simple and does not require much machine work, yet the tool serves its purpose exceptionally well.

Another time-saving tool is that shown in the drawing below. It is for cutting the mica insulation of small motor commutators below the surface. A portion of a hack saw blade forms the cutting element. The handle is made hollow to carry spare blades, the cutting edges of which vary in thickness.—J. D. George.



How the saw for cutting commutator mica is made. The whole tool is only 6½ in. long

Making a Small Sheet Metal Punch Press

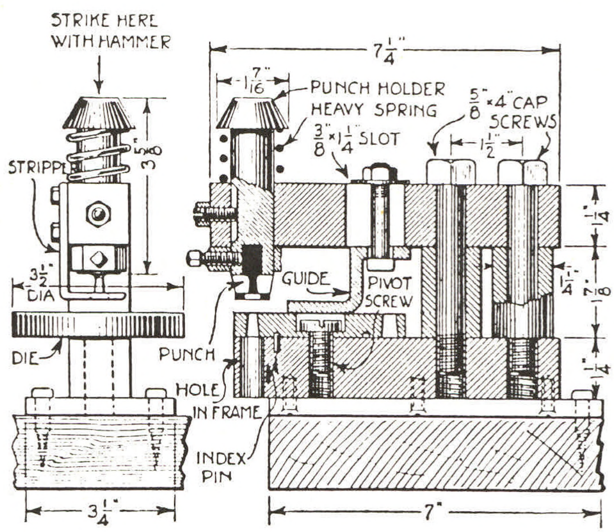
By Robert S. Lewis

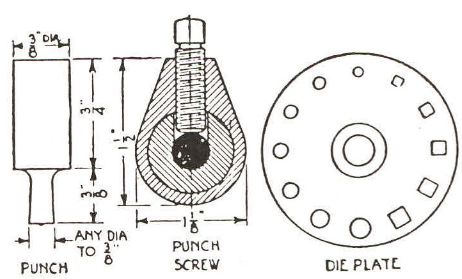
WORK often done on sensitive drill presses, such as drilling rivet holes in thin sheet metal, could be accomplished more quickly and cheaply on a light punch press. Also, in the experimental departments and in the model building workshops of amateur mechanics, a small punch press is a handv tool.

A punch can be made with little trouble if square bar stock is used for a frame. For punching sheet stock up to ⅛ in. thick the power of a heavy hammer blow is sufficient; this does away with the need for cams or toggles.

The main frame of the punch press is made of two 1¼-in. square pieces of steel connected with two ⅝-in. cap screws, which run through the two round pillars, as shown. The pillars are turned and drilled out of cold rolled steel shafting.

The bottom part of the frame is mounted on an iron base, which is secured to the workbench by lag screws.





How this useful light punch press is put together, and details of the punch, punch screw, and die plate

While individual punches are usually necessary, a single piece will answer for the dies. This die plate, made of tool steel, is fastened to lower member of the frame with a ½-in. flat head machine screw. It is indexed by means of a small index pin. In making this die plate, drill all the index holes as accurately as possible, clamp the die plate on the frame, and by using a sharp center punch in the punch holder, mark off the location of the holes; then drill and ream them to actual size.

Square, triangular, or any shaped holes can be made in the plate. A ½-in. hole central with the punch will allow the blanks to fall through.

The upper part of the frame is mounted squarely on the pillars in line with the lower part and is slotted for the adjustable guide bolt. It also is drilled on the forward end for the ⅞-in. punch holder spindle. This punch holder is flattened on its front face and is held from turning by a 5/16-in. screw and jam nut. On the punch holder is a special collar, which carries a thread for the punch retaining screw and also serves to prevent the punch holder from flying out of its hole.

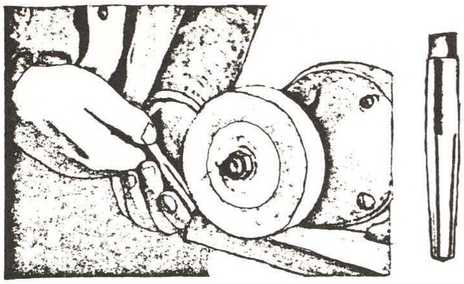
A rather heavy spring is placed between the conical head of the punch holder and the frame top. It cushions the blow after the punch has gone through the metal and returns the punch and spindle to their upper position.

To the side of the upper frame is fastened a sheet metal stripper, which holds the metal down when the punch is being drawn up through the punched hole.

An adjustable guide is used to punch a line of holes equally distant from the edge of a plate. This can be removed so that there will be a total clearance of 3½ in.

The hammer used to operate the punch should weigh about 5 lbs. Punches are made of ⅜-in. drill rod suitably hardened and drawn. The die plate is machined up and also hardened and drawn; it should be a good grade of carbon tool steel.

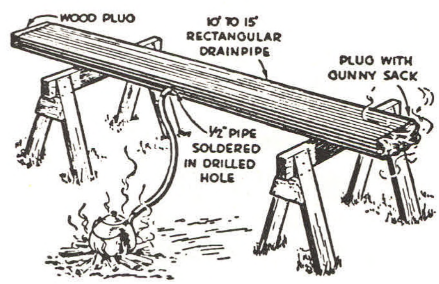
While this is a simple piece of mechanism to build, it will prove a valuable tool and will be appreciated by the workmen because of its small size and large capacity for work.



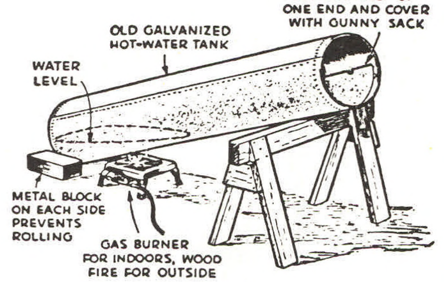
General Utility Reamers Made from Old Taps

USEFUL reamers for ordinary rough work can be made from tapered threading taps which have been discarded because of broken ends and cutting edges. These are ground as illustrated above, the bottom of the threads being used as a guide. They should be ground slightly more on the heel or back of the cutting edge so as to follow through without binding. The regular tap and die handle may be used.—M. W. MUTSCHLER.

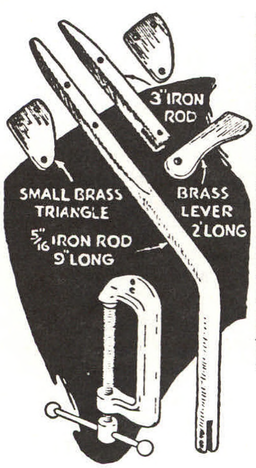
HOME RIGS FOR WOOD STEAMING



Rectangular drainpipe is often used by professional boat builders for steaming when regular rigs are not at hand. If a metal cap is used on one end, water can be held in it and that end placed in the fire.



Another convenient steaming rig for wood is an old water tank with one end partly cut out. The boiler can be placed on two props, if preferred, and the steam led in by hose from an external source.

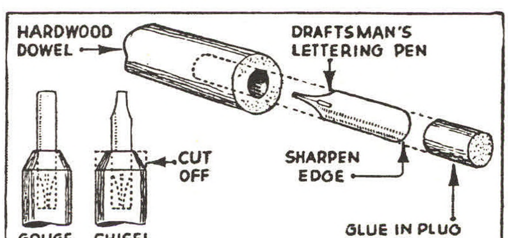


Pressure on the cam lever tightens the vise jaws so they grip the hook securely

Low-Cost Vise Holds Hooks for Tying Casting Flies

THE most essential part of fly-tying equipment is a vise to hold the hook. The one illustrated requires a 9" length of 5/16" iron rod. With a hack saw cut a slit in one end about $\frac{1}{2}$" deep. Heat the rod and flatten the opposite end so that the flat side is parallel to the slit. Five inches from the flattened end, bend the rod to an angle of 120 deg. When the rod is cool, grind it to a taper on the other three sides of the flattened end. Fit a small C-clamp into the slit, drill holes through rod and clamp, and fasten with rivets.

To complete the head of the vise another piece of iron rod 3" long is ground to a taper on one end, and a slit is cut in the other. A brass lever 2" long with a hole drilled slightly off center is riveted into this slit so as to form a sort of cam to tighten the vise jaws. Now attach this rod to the upright with triangular brass pieces as shown.—HOWARD HOADLEY.

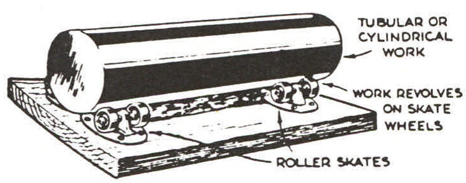


Carving Tool Made from Pen

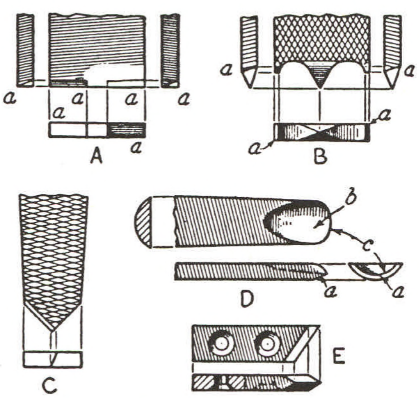
CRAFTSMEN who carve miniature models frequently have difficulty locating steel gouges and chisels sufficiently delicate for the work. I've found that excellent tools can be made from lettering pens.

Mount the pen in a hollow hardwood dowel with the point inward, anchoring it with a plug glued in place. Taper the tool end of the holder. Sharpen the edge of the point and grind it to the desired shape.—*K. T. Fowler, Evanston, Ill.*

CYLINDRICAL WORK is easily marked, soldered, or welded on this support, as it can be turned to any position without rolling it all over the workbench. The heel flanges were cut off two old roller skates and the skates were screwed fast upside down to a heavy baseboard. This arrangement saves much working space on a crowded bench.



UNUSUAL CUTTING TOOLS MADE FROM OLD FILES



Gouge, socket-hole cutter, countersink, and other special tools made for emergency use

WHILE it is not a new idea to use old files or pieces of them for various workshop uses, they will make many types of more or less unusual cutting tools in an emergency.

In the sketch at *A* is shown an oblong piece of file with two cutting edges *a*. It was used in a two-fingered chuck to smooth out a washer seat on an old plumbing fixture that could not be replaced.

B is a socket-hole cutter for radio chassis work. The center for the socket hole should be made first with a small drill, about 1/8 in. The center of the cutter is about 3/16 in. longer than the cutting edges. The tool is held in a brace loosely enough so that the cutting points *a* both rest on the chassis without lifting.

At *C* is a small, flat piece of rasp ground with edges at a 45-deg. angle and beveled. This makes a good countersink for metal work. The faces of the edges opposite the bevels are smoothed to form better cutting edges.

Sketch *D* shows a gouge made from a file. The end is rounded, and the rounded side of the file ground as at *a* to give an angle of rise to the gouge when cutting. It is then hollow ground as at *b* to give the cutting edge *c*.

E is a tool to be rigidly mounted on a space-winding coil winder and so set that as the coil form is turned in the winder, the point of the cutter will make a V-shaped groove for the wires.

Files and especially rasps are easy to break evenly if a deep groove is ground around the part wherever it is desired to break off the steel.—H. B.

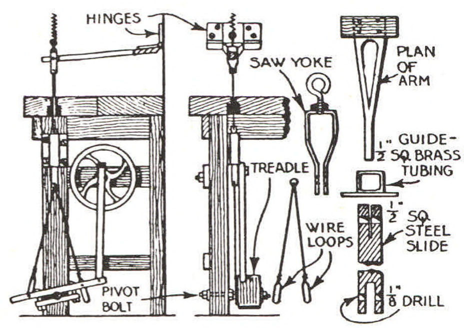
How to Build a Heavy Duty Bench Fretsaw

By Joe V. Romig

ONE of the handiest tools for the home workshop is a heavy duty bench fretsaw. It will do a large variety of useful work in both wood and the softer metals, and saw blades can be bought in numerous lengths and widths.

The saw illustrated costs little to build. When the blade is disconnected, it can be dismantled and the frame folded back against the wall so as to leave the top of the bench clear for other work.

The double action treadle is coupled to a flywheel by means of a wooden connecting



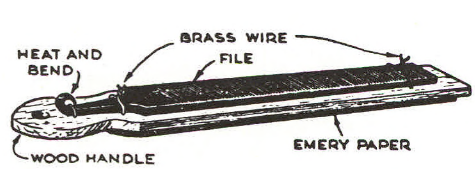
Side and front views of the fretsaw and details of the arm, yoke, slide, and guide

rod. A wheel that will serve for the flywheel usually can be found in the junkyard.

The saw arm is wood, shaped as shown, and is hinged to the wall at the back of the bench with two hinges. A saw yoke made of thin sheet metal is fastened to the outer end and is tapped for a screweye, to which is fastened the end of the spring.

The slide and guide are simply a square length of steel running up and down in a square brass tube soldered to a flat brass plate. The slide piece is slotted at each end and drilled, as shown, for the pins that hold the saw blade and treadle wire.

Each end of the treadle wire has an elongated loop that slides on round headed screws in the edge of the treadle. The throw of the crankpin on the flywheel should be about 6 in. and the total travel of the treadle at the points where the wire is connected with it should be about 3 in. As the saw blade is always pulled upward by the spring, the mechanism comes to rest with the treadle in a horizontal position and therefore can be started with a light pressure of the foot.



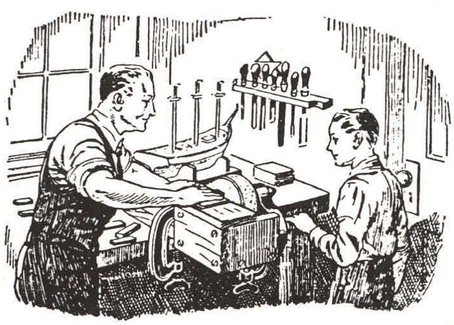
Sandpapering Made Easy

How to Rig Up a Hand Tool Grinder for Truing and Smoothing Small Pieces of Wood

By Edward Thatcher

SHIP model makers and others using many small pieces of wood which have to be fitted accurately together, will find that the simple sandpapering device illustrated saves much time and patience. With its aid small pieces of wood may be squared up quickly, and that is usually no easy task.

Most home mechanics number the hand tool grinder among their possessions. In place of the grinding wheel is mounted a wooden disk faced with sandpaper. A simple wooden table is made to support the work being sanded and a guide strip of wood may be attached to this table with brads, either at right angles to the sandpaper or at any required angle. The grinder may be driven with one hand and the work held against the guide and pressed toward the revolving sandpaper with the other hand.



Strips and small blocks of wood can be shaped very accurately with this machine

The tool grinder and the disk sander, together with the table, are mounted on a flat strip of wood, which may be clamped to the bench or held in vise jaws. The grinding wheel may be replaced quickly for grinding, or other wooden disks, faced with different grades of sandpaper or emery cloth, may be substituted.

Even shops equipped with a power disk sander or a lathe fitted with a disk sander, will find this little sander useful, as it can be attached to the bench near the work, where it will save many steps.

TO MAKE the sander, first remove the nut and grinding wheel from the grinder. From a block of pine or whitewood ⅞ or 1 in. thick, saw out a disk of about the same diameter as the grinding wheel. The block should be thick enough so that when it is screwed on the threaded spindle of the grinder, the end of the spindle will not project beyond the face of the disk. Bore a hole through the center of the disk so that it may be screwed securely on the spindle.

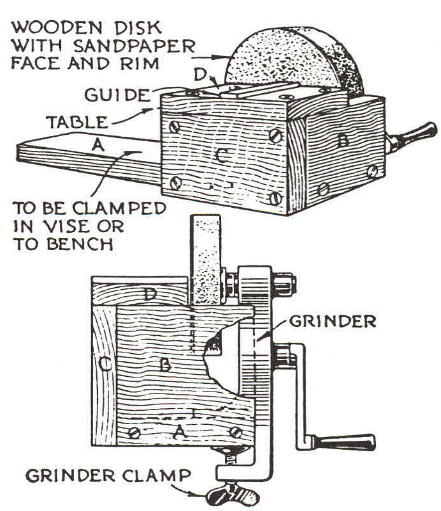
Before turning up the face and edges of the disk, build the table on its supporting strip; then you may do the turning directly on the grinder. This strip and table are of any soft wood, but care should be used to see that the pieces are as true and accurate as possible. Particularly should the top of the table be square and true and at right angles to the surface of the disk. The top should come up to the center of the disk. The dimensions of these parts will depend on the size of the grinder. This part of the work may be glued and nailed together, or, better still, glued and screwed.

At one end of the supporting strip, A, is glued piece B and to this and the supporting strip is fastened piece C. At the end of piece C and resting on A is another piece forming the third side of the boxlike support of the table, D. Use a square when attaching the guide to the table top, if you are setting this at right angles to the sander.

With the grinder clamped in place, see that the untrued disk is as square as possible with the table top and that it runs freely. Get a friend to turn the grinder handle for you while you use a small gouge to true up the face and surface of the disk. A chisel edge may be used to scrape the surface to a flat finish.

See to it that the face of the disk is square across and then glue on your sandpaper. A square piece may be used and trimmed around with a knife after the glue dries. A strip of sandpaper also may be glued around the outside edge of the disk and will be found useful as a drum sander.

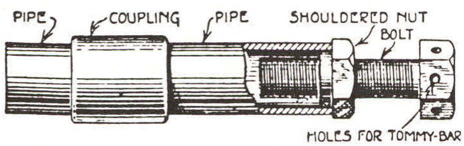
For small work very fine sandpaper is best. Always bear with a light pressure.



A general view of the disk sander and how it appears from the working end

A Small Bench Jack Made from Pipe Fittings

WHERE it is necessary to apply considerable pressure to work, a convenient small jack is easily made from common materials. For the



An extension jack that is useful for applying pressure. It is made from pipe fittings

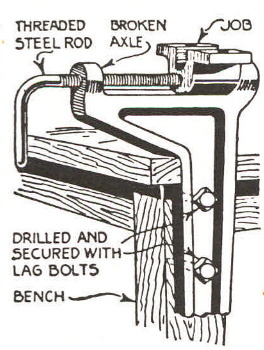
body use a piece of pipe or tubing of any desired size. For the screw use a common bolt with the head drilled with holes for a tommy-bar

File a shoulder on the nut, making the shoulder of such diameter that it will be a driving fit in the pipe. In the other end of the pipe there may be loosely inserted whatever is requird in the way of a pad, center, or the like.

If a long body is needed, use pipe threaded and fitted with couplings, permitting lengthening to any desired extent. If a broad base is required, screw the end of the pipe into a common flange fitting.

Broken Front Axle of Automobile Forms Strong Vise

A SERVICEABLE vise for holding parts while doing repair work in the garage can be made from the end of an old broken front axle. Drill two holes so that the part can be bolted in an upright position on one of the bench legs. Tap one of the yoke ends for a clamp screw if the yoke is not already tapped, as is the case in some axles. A length of steel rod is threaded to suit the yoke and one end is bent to form a handle.

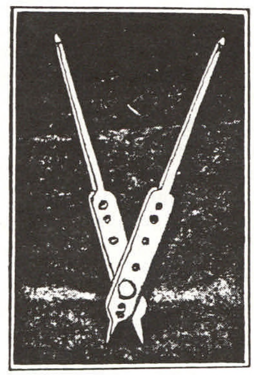


A cheap bench fixture

Wide parts that could not be placed in a small vise can be clamped in this one for drilling, filing, and the like.—A. G.

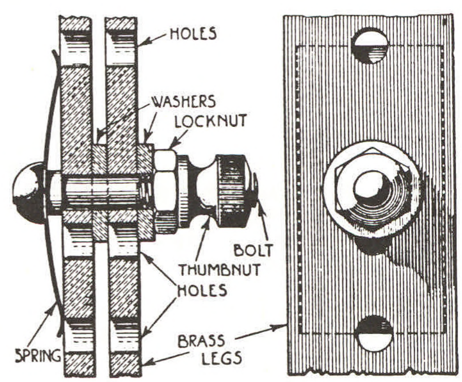
Accurate Proportional Dividers Made from Strips of Brass

HAVING frequent need for a pair of proportional dividers, I decided to try to make them for myself. I obtained two pieces of brass 3/16 by 1 in. and 12 in. long, although I later discovered that ⅛ in. by ¾ in. would have been better, as my dividers are really heavier than necessary. I clamped the two pieces together and drilled a series of 3/16-in. holes for the bolt. The spacing for the holes was as follows, measuring from the enlarging end of the dividers: For the proportion of 1 to 1¼, 6.666 in.; for 1 to 1½, 7.2 in.; for 1 to 1¾, 7.64 in.; for 1 to 2, 8 in.; for 1 to 2½, 8.572 in.; for 1 to 3, 9 in.; for 1 to 4, 9.6 in.; for 1 to 5, 10 in.; for 1 to 6, 10.287 in.; for 1 to 7, 10.5 in.



The dividers complete

After drilling the holes, I cut away part of the brass with a hacksaw and smoothed the points to the shape shown in the illus-



This joint holds the legs firmly in place

tration. A piece of phonograph spring was used in connection with the joint, as shown. To make the hole through it, I laid it on a piece of iron and made a dent in it with a center punch, and then filed off the conically raised portion. I repeated this several times until the hole was large enough to enable me to put the end of a small rattail file in it and file it to the proper size.

The bolt, locknut, and thumbscrew were taken from an old spark coil. Washers were placed between the legs and also under the locknut.—FRANCIS H. VAN HISE.

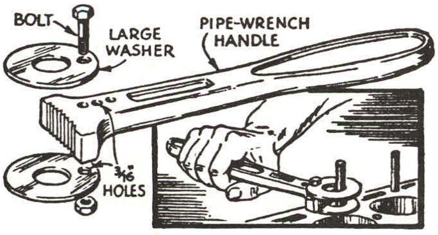
Gear Puller Made from Jaws of a Pipe Wrench

Made from Two Pipe-Wrench Jaws, This Puller Is Adjusted Quickly to Fit Various Gears

Utilizing the jaws from a couple of pipe wrenches, this adjustable gear puller will handle fairly heavy work. To make it, a piece of bar steel is drilled and tapped in the center for a large bolt, which should be pointed on the end. Half way between this hole and the ends of the steel bar, two holes are drilled to take the wrench jaws, which fit over the rear side of the gear when pulling it. As the regular wrench nuts are used on the jaws, they can be adjusted for length as required.—Herbert E. Hawkins, Rogers, Ark.

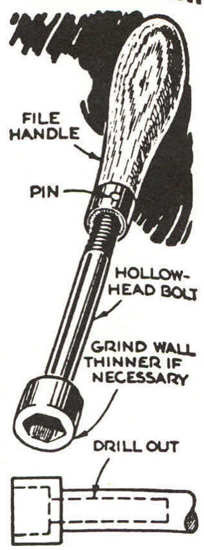
Handy Stud Wrench Is Easy to Make

A HANDY stud wrench can be made by boring a hole just back of the toothed shank of a discarded pipe-wrench handle, and bolting two large washers to it on opposite sides, as shown below.—A. W. H

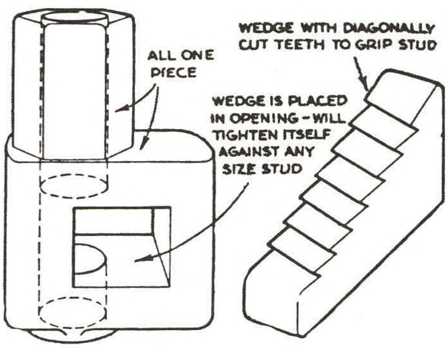


Washers mounted on a pipe-wrench handle enable it to grip cylinder-head studs

Wrench from Hollow-Head Bolt



A SMALL socket wrench, handy in radio and auto-ignition work, can be devised in a short time from a hollow-head bolt. Select a bolt with a hexagonal opening to fit the nuts desired (6-32, 10-32, and 10-24 are among the commonest sizes), and attach it to a file handle with a pin through the ferrule to prevent rotation. Drill out the shank of the bolt for 1" or so to accommodate nuts on long bolts. If you wish a thin-wall socket wrench, grind the wall thin.—E. SCHNOEBLEN.



Stud Remover Made from Steel Block and Toothed Wedge

TO MAKE this handy tool, cut enough stock away from a block of steel to form a hexagonal head at the top. At the bottom, cut back a 1/16" relief everywhere but directly under the nut. Drill a hole through this portion of the body, as indicated by dotted lines on the sketch above, to accommodate the largest size stud to be removed. The device also works on smaller sizes.

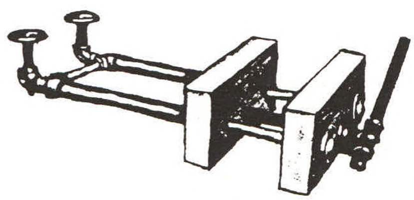
Next, mill a rectangular hole through the side of the block so that the inner edge will bisect the drilled hole. Cut a triangular wedge to slip easily into the milled hole. After cutting several diagonal teeth in that portion of the wedge which will contact the stud, harden and temper it.

To remove a stud, slip the body of the tool over it and insert the wedge. Apply a wrench to the hexagonal head. The more force is applied, the tighter the wedge grips the stud.—E. S. HARRIS.

Homemade Vise Has Guide Bars Made of Pipes

A STRONG vise is a necessity in any home workshop. In the accompanying illustrations is shown how I constructed an exceptionally substantial vise with a framework of pipe and pipe fittings.

First one should obtain two hard, close-grained blocks of wood for the vise jaws. These are bored at each side for the ¾-in. guide pipes and in the middle to take the steel vise screw, which can be bought complete with nut, flange and handle at



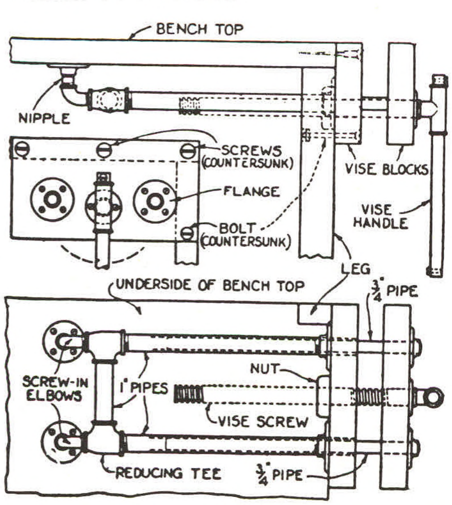
A heavy-duty woodworker's vise with guides to insure the parallelism of the wooden jaws

any large hardware store. The holes in each block should correspond exactly so that the movable jaw will slide easily.

The two guide pipes are threaded on one end and screwed into floor flanges, which are fastened to the front of the movable block. These may be made secure with pins, and a plug can be inserted in the open ends of the pipes.

The guide pipes slide in two 1-in. pipes that are fastened to the back of the stationary jaw by means of flanges and braced at the back by a short cross pipe and two flanges screwed to the underside of the bench top, as shown. The two tees screwed in the ends of the 1-in. pipes are of the type that has two 1-in. outlets and one ¾-in. outlet. A screw-in elbow and small nipple are used to connect the outlets with the flanges fastened under the bench top. All pipe dimensions are, of course, inside diameters.

The vise screw is assembled in the usual manner. The flange is screwed to the front block, and the nut to the back of the stationary block. The stationary jaw is fastened to the edge of the bench top.—WILSON G. WALTERS.

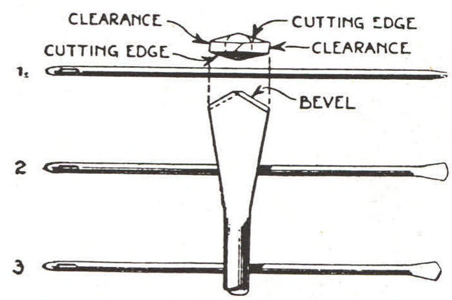


Side, front and under views of the vise showing how it is assembled and fixed to the bench

Use Sewing-Needles for Drills in an Emergency

WHEN a small drill for metal is required and a regular drill is not at hand, the home mechanic can make one with very little difficulty from an ordinary sewing-needle. The only trick is in grinding the point.

The first step is to heat the end of the needle and flatten it to the illustrated

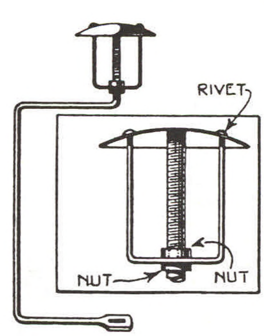


The steps in converting a needle into a drill and an enlarged detail of the point are here illustrated

shape. Then grind it carefully to a point, following the drawing exactly and taking care to provide the necessary clearance. By heating the end again and plunging it in water, it can be retempered. To hold the drill-point in an ordinary breast drill it will be necessary to push the "eye" end into a piece of soft wood small enough to enter the jaws of the drill. When the jaws are tightened, the wood will be compressed sufficiently so as to grip the drill-point tightly.—P. A. BAUMEISTER.

An Old-Time Brace and Its Construction

FOUND among the interesting relics of Revolutionary days resurrected from the trash-pile in the attic of an old building was a brace that had evidently been made by a blacksmith for use in his own shop. Its form and construction are clearly shown in the illustration.



Observe the clever construction of the handrest

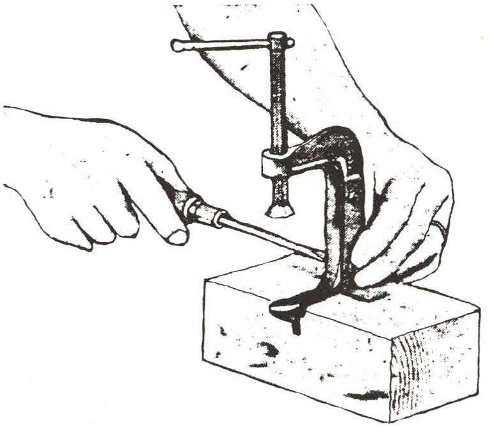
Of particular interest is the ingenious method by which the maker solved the problem of providing the brace with a swiveling handrest. The illustration needs no further explanation. The shank of the drill or auger is fitted into a square hole of the tool arm of the brace.

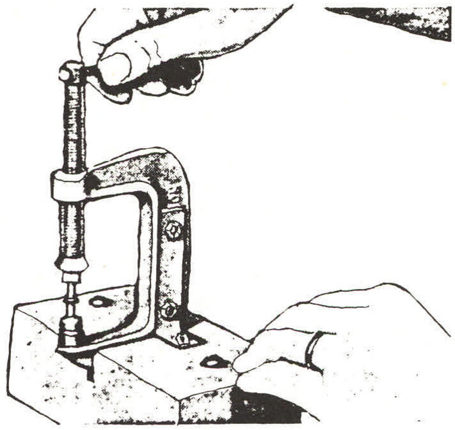
Arbor Press for Handling Small Work Is Made from C-Clamp

SCALED to modelmaking size, this little arbor press will push studs in or out and, in its own small way, do anything a large press can do. It consists of a 3½" or 4" C-clamp, preferably one of good quality, held to a slotted hardwood block with two angle brackets.

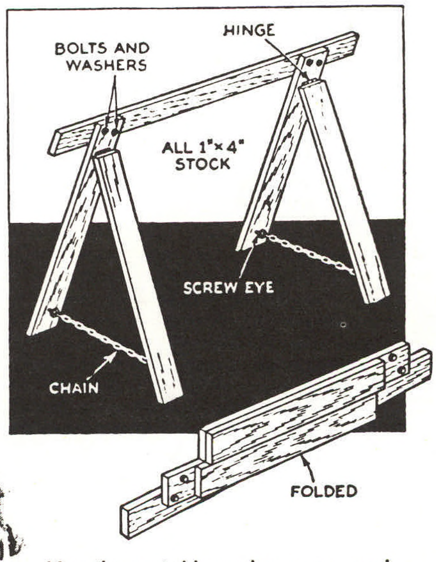
Recess the block with a chisel to take the clamp web at the stationary-jaw end snugly up to the flange, and bevel the edges of the block. Drill bolt holes in the clamp frame, bolt it between the brackets, and screw the latter firmly to the block. Paint the clamp, brackets, and block machine gray, but take care not to get paint on the threads.

In use the press is bolted to the bench. Oil the clamp-screw swivel foot to make it work freely.—H. P. S.





Light Wooden Horses Fold Up Compactly for Carrying

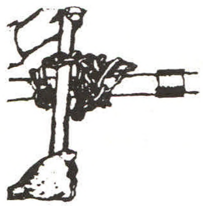


How the portable sawhorses are made. To fold them it is necessary merely to remove one of the bolts from each leg

ORDINARY sawhorses take up considerable space when not in use and are awkward to carry from one job to another, but this difficulty may be overcome by making them so that they will fold up.

Any sound 1" by 4" boards can be used, even pieces taken from packing cases, unless the sawhorses are required for heavy duty, in which case dressed hardwood is better. The two shorter legs are hinged to the long legs with heavy hinges at least 2½" long, and chains are added to prevent the legs from spreading. To fold up one of these sawhorses, a bolt is removed from each leg. It is then replaced in the free hole to prevent loss.—F. A. BLUHM.

Makeshift Pipe Wrench



IF YOUR pipe wrench is too small for a job, or if no wrench is available, just twist a loop of chain around the pipe as shown and use an iron bar or a piece of pipe for a handle.

Utility Shop Stand Has Simple Adjustment for Height

IN EVERY shop there are times when an adjustable stand or table will save time and labor. Often when drilling an awkward piece of work, for instance, it is necessary to rest one end on a stand or have a helper hold it.

A useful stand for this purpose may be made as illustrated, chiefly from pipes and fittings. The lower part is a pipe of large

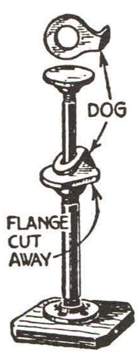


diagram illustrates the catch

diameter with floor flanges screwed to each end. The lower flange is fastened to a wide wooden base.

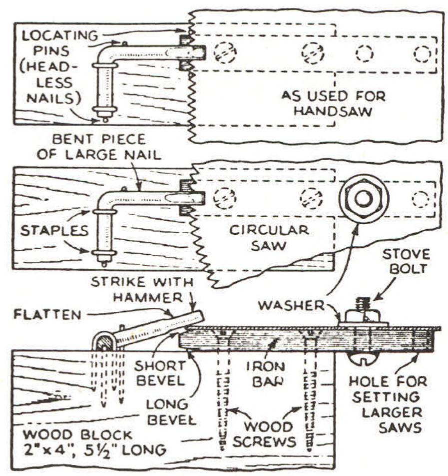
A pipe that will slide inside the first pipe and of suitable length is fitted with a flange at one end. To this flange is fastened any desired type of top. A dog made as shown is slipped over the upper pipe before it is inserted in the lower part of the stand.

When pressure is brought to bear on the top of the stand, the dog will grip the smaller pipe and hold it firmly in any position. A portion of the upper flange of the stationary part of the stand is cut away so that a turn of the upper part will cause the dog to release its grip and allow the top to be lowered.—JONAS J. BYBERG.

SAW TEETH QUICKLY SET WITH SIMPLE DEVICE

FOR giving a uniform set to the teeth of circular and other saws at the time they are filed, a surprisingly simple fixture can be made as shown below from a few scraps of wood and iron. With it, the unpracticed hand can do a good job of setting, and do it more rapidly than with some of the more commonly used setting tools. The device is gripped in a bench vise while being used.

A piece of 2 by 4-in. block, 5 in. or more in length, will be suitable for mounting the metal parts. These will include a piece of flat or square iron bar, 1/8 by 1/2 in. or more in size, and 1 in. longer than half the diameter of the largest circular saw to be accommodated; a short stove bolt with nut; one washer slightly thicker than the circular saw and of an outside



Top and side views of the fixture, which enables saws to be set speedily and accurately

diameter to fit snugly inside the hole in the saw; another of larger outside diameter; and a large nail or spike.

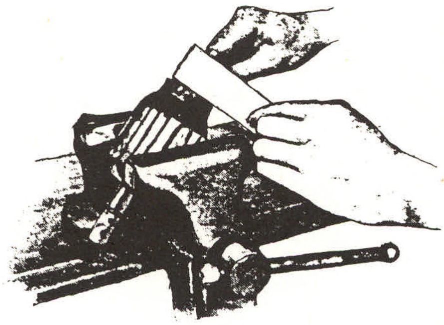
With a file, bevel off the end of the flat bar to the angle desired for setting—usually from 10 to 15 deg. Hold the circular saw against the bar in the position shown, with base of teeth at top of bevel, and scribe a circle inside the saw hole. In the center of this circle, drill a hole through the iron bar to receive the stove bolt, not too loosely.

A piece of the large nail, filed slightly flat at one end, bent to a right angle and attached with staples and nails as shown, rests upon the saw tooth and, when struck with a hammer, quickly bends each tooth in turn to the angle of the bevel on the iron bar. For use in setting handsaws or band saws, two additional locating pins may be driven into the wood block as indicated in the upper sketch.

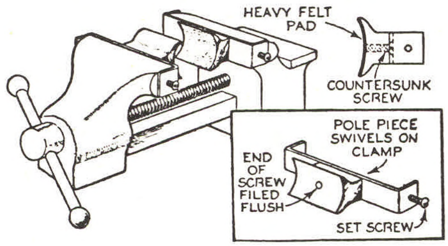
Each time the same circular saw is filed, the bevel on the flat bar may be filed slightly, to adjust it to the shortened radius of the saw. Fifty teeth or more a minute can be given a smooth, uniform set in this way. Ripsaws will require a longer bevel and therefore a different flat bar. If, however, the bar stock is stiff enough (not less than 3/8 in. in thickness), one side can be beveled for rip and the other for crosscut teeth. Reversing is then accomplished by removing the two wood screws.—H. K. RANDALL.

Curved Auxiliary Vise Jaws Made from Old Field Poles of Motor

CURVED and swiveling auxiliary jaws to hold small armatures and other round pieces in the bench vise can be quickly made from a couple of pole pieces taken from a discarded auto generator or motor field frame and a length of ⅛-in. strap iron. Cut the strap, which may be made from ¾ to 1¼ in. wide, into two lengths, each 2 in. longer than the width of the vise jaws, and bend the ends at right angles as shown.



Drill and tap a hole for a 3/16-in. set screw in one side of each piece; also drill a hole through the center of each clamp of such a size that the original screw of the pole piece makes a close but turning fit in it. Countersink these holes on the inside, then attach the pole pieces and grind off any part of the screw ends protruding from the concave face. Glue or cement pieces of heavy felt or rubber over the curved faces to protect the work from any injury.

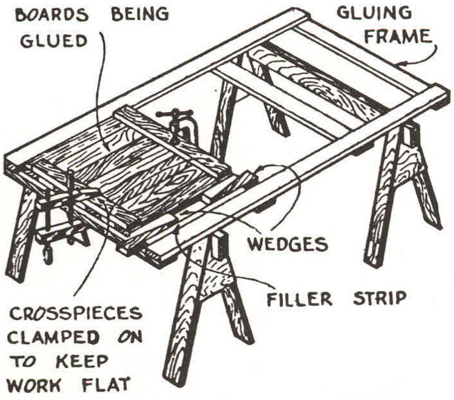


Although designed especially for clamping armatures without injuring the windings or laminated cores, this jig is adapted for holding any cylindrical article within its capacity. Because of the swiveling feature, the jig can hold work at any angle.—W. C. W.

Heavy Frame Aids in Gluing

MANY amateur woodworkers do not own cabinetmakers' long bar clamps and therefore are handicapped because they have no easy way to glue a number of narrow boards together to form a wide board or large panel. All that is necessary, however, to do this type of work quickly and conveniently is to build a heavy frame from rough lumber, such as scrap crating, as shown in the accompanying illustration.

The frame consists of two sidepieces and four crosspieces strongly nailed or screwed together. It may be of any desired size, but its width between the sidepieces should be several inches more than the width of the largest panel that is likely to be glued up. For convenience in use, the frame may be set across two sawhorses or other supports and at other times it can be stored against a wall or in some out-of-the-way place in the workshop.



When properly jointed and prepared, the boards which are to be glued are laid on the crosspieces. A short panel is shown in the drawing, although obviously a panel of any length within the capacity of the frame can be made. Four, six or eight wedges are prepared and a filler strip or board is laid along one of the sidepieces to take up any waste space. Glue is then applied to the edges of the boards and pressure is obtained by means of the wedges.

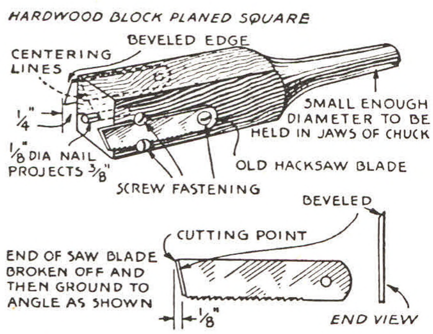
Heavy crosspieces, such as scrap lengths of 2 x 4, are then laid across the glued-up panel and clamped to the frame with hand screws or C-clamps as shown to keep the work flat until the glue has set.

A frame of this type will be found more convenient to use than other kinds of improvised clamps because there is a flat bed on which to rest the work, a solid bearing for the wedges, and crosspieces to which to clamp the work to keep it flat.

IMPROVISED TOOL CUTS HOLES IN THIN METAL

THIS improvised tool will cut circular holes through any comparatively soft metal up to ⅛ in. thick without marring the surface, even if painted or lacquered. It will also cut through pieces of thin gage without bending them.

If a 1-in. hole is required, for example, plane a stick of hardwood 1 in. square, cut it off about 4 in. long, and round one end so that it can be gripped in the jaws of a brace.



The assembled tool and a drawing of one of the cutting blades to show how it is ground

Mark the square end of the piece with diagonal cross lines, and where they meet bore a ⅛-in. hole 1 in. deep. Drive a headless nail into this hole, allowing it to project about ⅜ in. Now take an old hack saw blade and break off a piece from each end, including the eye, approximately 1½ in. long. Grind each as shown and fasten them with short roundhead screws to two opposite sides of the block. Smaller screws driven beside each blade will prevent side motion.

Drill a ⅛-in. guide hole in the metal, slip the nail into this, and turn the brace until the cut has gone half through; then cut from the other side.—J. ANDERSON.

Filing Awkward Shaped Pieces

HAVE you ever tried to file an awkward shaped piece or part that came almost level with the top of the vise? If you have, then, no doubt, you bruised your knuckles

This handle saves knuckles from being bruised

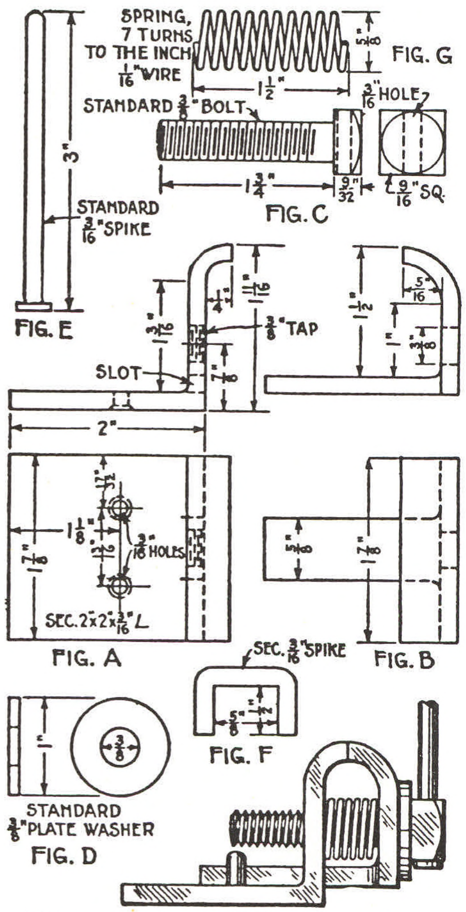
just as the writer did until he made the little file holder illustrated.

A groove is made to fit snugly over the tang of the file, and the handle, being above the level of the file, allows you to work without danger of bumping your knuckles. This is a stunt worth trying if you have much filing to do.—J. F. H.

Vise Made from Bolt, Angle-Irons, Spikes and Spring

I MADE the vise illustrated from two pieces of 2 by 2 by 3/16 in. angle-irons, two spikes, one ⅜-in. bolt 1¾ in. long, one spring picked from the scrap pile, and one ⅜-in. plate washer.

One piece of angle-iron was bent as shown in Fig. A. Two holes were drilled in it and countersunk underneath, so that the guide made from the spike, shown in Fig. E, could be riveted flush with the bottom



The parts and how they are assembled

of the lower surface of the angle. Then I cut a slot ⅝ by 3/16 in., to take the tongue of the other angle-iron, Fig. B.

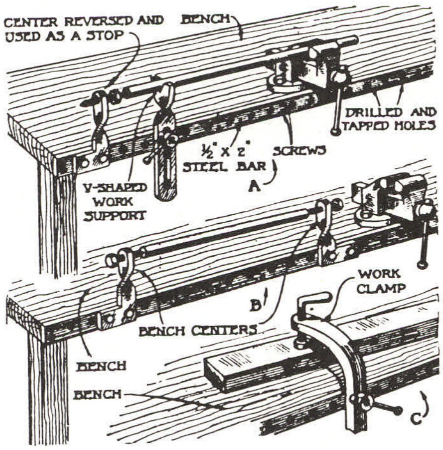
After I had slipped Fig. B through the slot, I drilled a 5/16-in. hole through both angles and tapped it for the ⅜-in. bolt, Fig. C. This was done so that the two holes would line up exactly. I then reamed out the hole in Fig. B to ⅜ in., so that the bolt would turn freely in it. The head of the bolt was drilled for the second spike, which served as a handle.

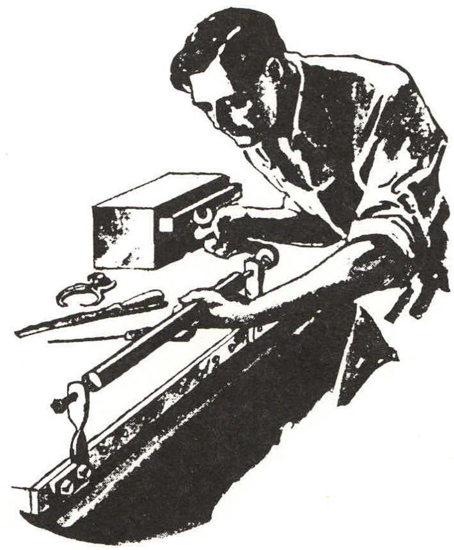
How the vise goes together is clearly shown in the assembly drawing. All it cost me was two hours' time.—F. N. WACHS.

BENCH FIXTURES TO AID MACHINISTS

MACHINISTS who have to do a variety of bench work can improve their benches by the addition of timesaving accessories like those illustrated in the perspective sketches below.

The work support and stop, bench centers, and work clamp illustrated at *A*, *B*, and *C* respectively are only a few of the handy aids that can be quickly fastened to the front edge of the bench if it is equipped with a ½ by 2 in. strip of cold-rolled steel as shown. This strip is drilled with a series of equally spaced holes,



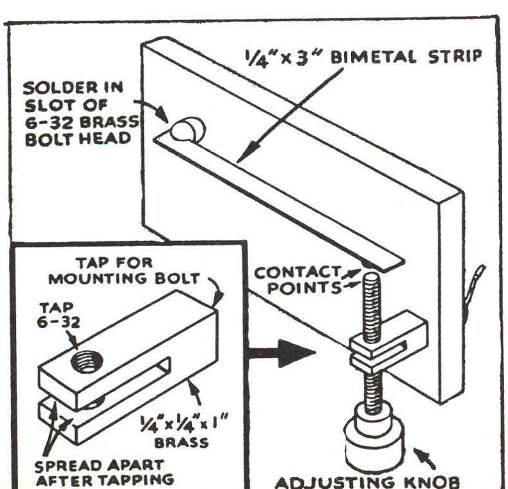


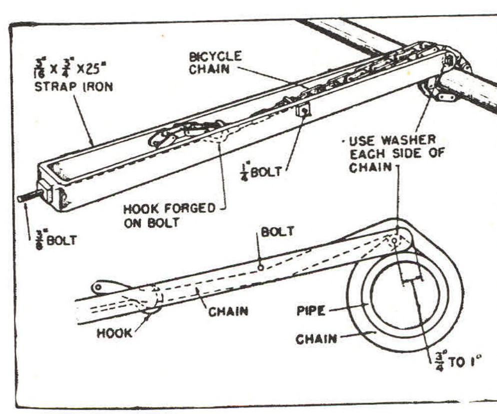
Machinist's bench fitted with a front plate to which numerous fixtures may be screwed.

which are tapped to take the ⅝- or ¾-in. screws on the attachments. A few countersunk holes also are drilled for the screws used in fastening the strip to the bench.—CHARLES H. WILLEY.

Slotted Post Holds Adjustment

CRITICISM of homemade or simple commercial thermostats often centers around the fact that is difficult to lock a setting without upsetting the adjustment. A small brass post, slotted as shown in the drawing below, can be made to lock the adjusting screw exactly where you want it. Tap the post, slot it with a hacksaw blade, and spread the prongs thus formed slightly apart. To insert the screw, squeeze the prongs together with a pair of pliers.—H. W. HOLT.





Pipe Wrench Grips by Chain

WORKING like a chain pipe vise, this homemade wrench grips a wide range of pipe sizes. Its 12" long frame is bent up from strap iron, with a clearance hole for a bolt in the short bend. A bicycle or motorcycle chain is bolted to the other end. The lever is laid against the pipe, the chain wrapped around the way you wish to apply force, and a link hooked on. The bolt nut gives adjustment.—*C. L. Meehan, Lakeview, Ontario.*

A Bow-Drill for the Work-Shop

THE bow-drill about to be described will be found a most useful addition to the average amateur's workbench, and although the size of the drills somewhat restrict its field of usefulness, it will be found invaluable in the construction of certain classes of apparatus.

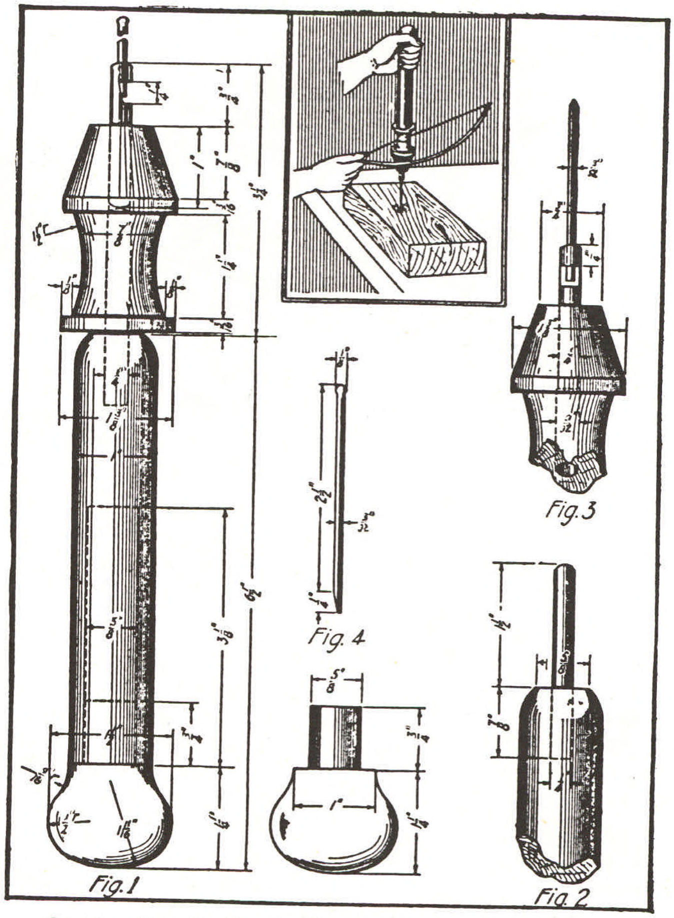
The handle should be turned first, preferably from good ash stock. It is perfectly straight in diameter and 5¼ inches long. One end tapers in to ¾ inch. A ⅝-inch hole should be bored in the other end 3⅛ inches deep; this serves as a magazine for the drills.

The next step is to turn the knob or breast-piece. This is 2 inches long and 1½ inches at the widest point. One end is rounded off as shown in the diagram, while a shank ¾ inch long and ⅝ inch in diameter is turned on the other end. This fits the magazine and serves as a stop for it and as a breast-piece for the drill.

The next step is turning the spool, the dimensions of which are given in Figs. 1 and 3 of the diagram.

The chuck is next made. This is of iron or soft steel ¼ inch in diameter and 1¾ inches long. A slot ¼ inch long is filed in one side ¼ inch from the end; the upper side being filed 11/64 inches deep, while the lower side is filed 5/64 inch deep. A hole is next bored endways into this slot slightly larger than 3/32 inch; the other end is embedded into the end of the spool for one inch of its length and should not turn. A 9/32-inch hole should be bored in the other end of the spool up to the end of the chuck. This should be done before the chuck is put in so that the spindle will bear directly on the end of the chuck. This reduces the friction.

The next step is to embed the steel spindle in the handle. This had best be of steel, ¼ inch in diameter and 2⅜ inches long. One end should be slightly rounded, while the other is tightly embedded in the handle for ⅞ inch of its length. The spool on this spindle should rotate freely.



Construction details of a bow-drill adapted for actual workshop use

The drills are next made and are easily and cheaply constructed from the ribs of an old-fashioned umbrella. These ribs are of the finest spring steel. To make the point, cut the wire to the desired length, say about 3 inches, as this is long enough for average work.

Then heat the tip to a cherry red and hit it a sharp blow with a hammer to flatten it slightly, and quickly dip into cold water. This gives about the proper degree of hardness. The necessary clearance was given when it was flattened, and the point is then ground down until the flat side is very nearly a half-round and the narrow side tapers to a point at an angle of 30 degrees. The other end is filed off slightly on a long angle, as shown in Fig. 4. This slides up upon the slot in the chuck and prevents the drill from turning.

The bow is made of some limber wood, such as elm or hickory, and is trimmed down so that when bent it will give the desired tension to the string. This depends on the wood used and should be sufficient to keep the cord from slipping when twisted once around the spool. The bow used with the drill described was 2½ feet long, ¾ inch wide and ¼ inch thick. The cord should be of leather attached to one end and about 6 inches above the other end, which was left for a handle.

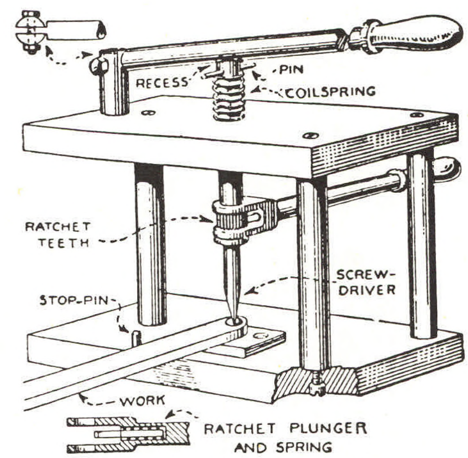
The chuck described here is expressly made for the wire drills, but if the maker has any other drills that bore with a backward and forward motion, he could use any design of chuck he wishes in order to accommodate the drills.

This bow-drill, if the points are well ground, will quickly bore wood or iron and if supplied with turpentine will even bore glass. When needed, the drills can be made longer, but when the length is over 6 inches care must be taken or they will bend when pressure is exerted on the handle. To rotate the drill, the bowstring is twisted once around the spool and the bow is then pushed rapidly backward and forward at right angles to the handle.—Rae McGooch.

Ratchet Fixture for Driving Machine Screws Tightly

THE work of assembling the parts of small machines and other mechanisms in large quantities, when many small screws must be handled, can be speeded up by the use of special fixtures for driving the screws in place. Usually a simple fixture for this class of work can be made at small cost, yet it may cut in half the time required by hand methods.

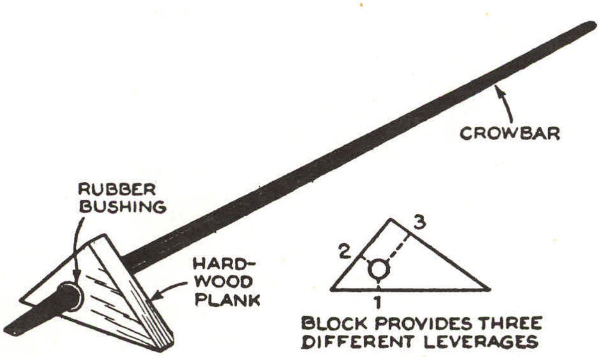
The construction of a screw-driving fixture I have been using on a difficult job is



The screwdriver bit is held down with one lever and turned with the other

shown clearly in the accompanying illustration. Pieces to be assembled are placed on the base plate with the screw inserted in its hole and the screw is brought in line with the screwdriver bit.

Bearing down on the upper handle holds the bit solidly in the screw slot. The screw then is driven rapidly home with the ratchet handle. When the upper handle is released, the coilspring at the top raises the spindle in position for the next screw.—F. J. W.



Crowbar Lever

A TRIANGULAR hardwood block drilled as shown, is a great help when working with a crowbar to lift heavy objects. The hole in the block is drilled to fit snugly so as not to slip in use. The distances from the hole to the sides of the triangle should be in the ratio indicated. The size of the block should be suited to the length of the crowbar and the weight of work.—*G. E. H.*

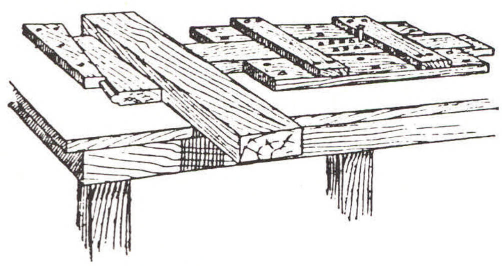
Universal Bench-Stop

A BENCH-STOP that will hold anything and everything a stop could ever be used for; that will hold work from three-eighths of an inch square up to heavy slabs of wood up to twelve inches wide and three and four or more inches thick, edgeways or laid flat; and that will hold any and all of this work perfectly square and without injuring edges and corners and yet hold it in a vise-grip, can be made in less than an hour from a few scraps of inch-board, as follows:

Take two pieces of inch-board 2½ inches wide and 12 inches long and nail them perfectly parallel, planed edges facing each other, to the head of the workbench. Keep them eight, ten, twelve, or more inches away from the edge of the bench, according to the extreme width of the work you plan to use the stop for. Then make another piece of the same thickness, but 18 inches long, and fit it so it will slide snugly between the two pieces. In the center of this piece bore a number of ¼-inch holes, ½ inch apart and ½ inch from the edge, and bore a couple of corresponding holes through the top of the bench, so that a large spike can be inserted and hold the piece in place. Nail a couple of strips crossways on to the two stationary pieces so this sliding piece cannot jump out.

Anywhere from six to twelve inches away from and opposite, and at right angles to it, nail one-half of a wedge made of tongue-and-groove inch-board, groove in, and let it engage with another wedge having a tongue.

A moderate pressure with the thumb against the movable wedge will hold the work in a bull-dog grip and without



A bench-stop that can be quickly adapted to every kind of work

injury, provided sufficient care has been taken to make the edge of the wedge and the end of the slide perfectly square.

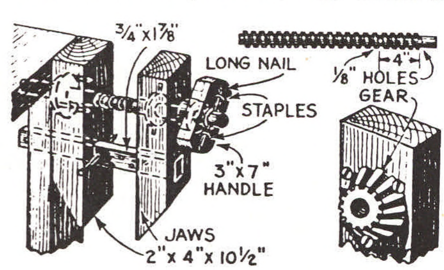
By cutting down one end of the slide to a thickness of ⅜ inch and inserting a piece of ⅜-inch board between the wedge and the work, thin boards and strips down to that thickness can be held and planed.

Small Woodworking Vise Made from an Old Auto Jack

FROM a discarded automobile jack of the screw type and some odds and ends, I made the useful bench vise illustrated.

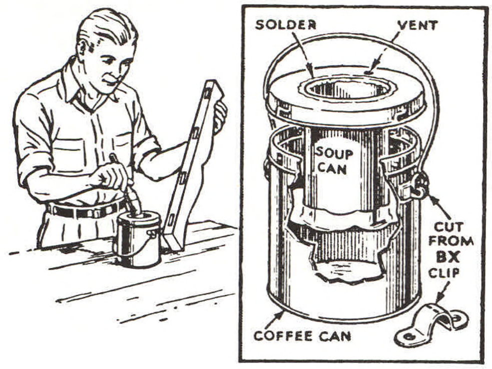
Two pieces of hard wood 2 by 4 by 10½ in. are cut as shown to form jaws. A hardwood strip ¾ by 1⅞ in. and as long as the jack screw, is mortised solidly into the lower part of the outer jaw and pinned in place. This strip, which slides through a slightly larger mortise in the rear jaw, has a series of holes drilled in it to take a large nail. The nail is placed, when the vise is in use, in whichever hole is most suitable for the work in hand, the purpose being to keep the outer vise jaw from turning and, at the same time, parallel to the rear jaw.

A hardwood handle ⅞ by 3 by 7 in. is fastened to the jack screw by means of



How the parts of a light screw jack are utilized in assembling a bench vise

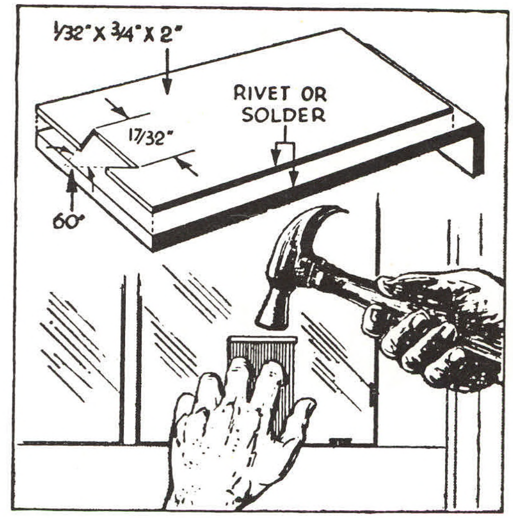
3 washers, 2 nails, and 2 staples as shown. The nut for the vise screw, which also is a part of the original jack, is fastened with screws at the back of the rear jaw. After the vise is assembled it is bolted to the bench.—E. D. THADDEUS.



Double-Boiler Glue Pot Built from a Pair of Tin Cans

NEEDING a quantity of hot animal glue, I made a double-boiler type of glue pot from two cans of different sizes. Hot water in the outer can keeps the glue hot sufficiently long so that a gluing job can be done almost anywhere in the shop or home.

A 1-lb. coffee can was used outside, and a small soup can was soldered to a hole cut in the cover of the first. A small hole punched in the cover permits escape of steam generated when the water bath surrounding the small can is heated. Ears made by cutting a BX-cable clip in half were soldered to the sides of the coffee can and a bail was added.—JOSEPH F. BAZATA.



Block Holds Glazier's Points

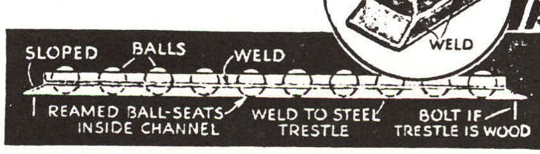
WHEN putting in window panes or framing pictures, I find the device sketched above a great time saver. The dovetail slot holds the point firmly against the glass and frame while the other end is tapped with a hammer. Another advantage of the holder is that points may be moved to position without slipping.—*H. R. Bowman, Baltimore, Md.*

How to Add Ball-Bearing Tops to Heavy-Duty Trestles

A BALL-BEARING top, applied to shop trestles, saves much back-breaking labor in handling large, heavy material.

Slope the flanges of one channel at each end and drill bolt holes if bolts are needed. Scribe the inside of the channel at the points where the balls are to rest; then make a slight seat for the balls with a blunt-pointed reamer.

Cut holes in a second channel for the balls, invert it, and weld the flange edges together after the balls are in place. Cut flanges from the top channel back far enough so the middle part may be bent down to close the ends of the two channels. Weld these ends.—J. C. COYLE.

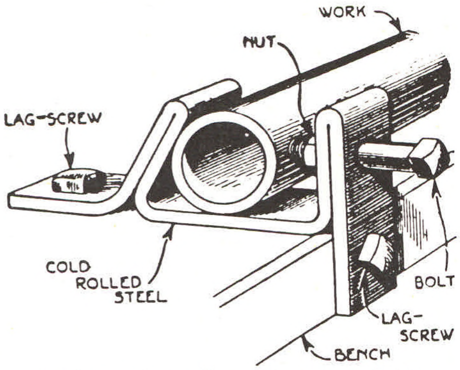


If the trestle is of steel, the tops are welded on; if of wood, bolts must be used

Simple Bench-Clamps for Bar Stock or Pipe

BENCH-CLAMPS can be made without requiring more than a bolt and nut and a drill to drill out the holes used for securing the clamps to the bench.

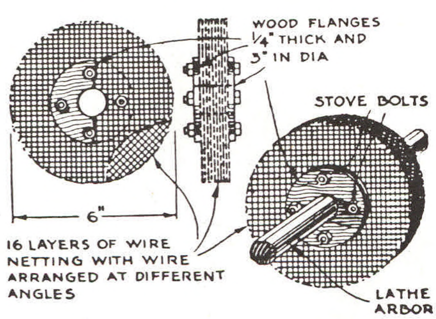
Virtually any steel-strap material can be used for making these clamps, as it can be



A 15-in. piece of steel strap, a bolt, and two lag-screws make this pipe clamp for the bench

cold bent to the desired shape. These clamps serve to hold bar stock or pipes while cutting, bending, straightening, or cutting pipe-threads. Use a piece of wrought iron or steel, about 15 in. long, for each clamp. Make the double bend shown and bolt to the edge of the bench.

WIRE SCREENING USED FOR BUFFING WHEEL



A quickly and cheaply made wire scratch wheel formed from disks of wire screening.

SOME time ago while doing a rush job, I found that I was in immediate need of a wire buffing wheel or scratch brush. Not having the time to go out and purchase the type of buffer I wanted, I worked out the idea illustrated above.

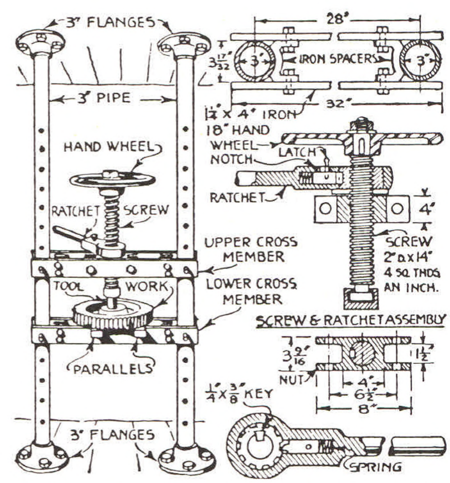
From some old wire screening I cut sixteen 6 in. diameter circles. These I placed one on top of the other in such a way that the wires in the screening did not run in the same direction. Then, with the aid of a coping saw, I cut two 3-in. disks from a piece of ¼-in. box wood. These I clamped on each side of the wire screening with four stove bolts.

To set up the buffer, I drilled a hole in the center and then mounted it on the lathe arbor.—JULES J. SIEKMAN.

Easily Built Press for Garage Handles Wide Range of Work

ONE of the most essential tools in the garage is a press upon which tight gears, sleeves, bushings, and the like can be set in place. In order to handle a large variety of work, the press must be quite large. The trouble with many commercial presses is their short vertical range.

The cheap and rugged press that is illustrated has a wide range and can be built with little difficulty. The main standards are 3-in. heavy pipe fastened to both floor and ceiling with 8-in. floor flanges. The pipes are drilled as shown for pinholes before assembling. The standards should be plumbed carefully when they are put in place. The cross members are built up of 1¼ by 4 in. bars of flat iron, which can be obtained from any hardware store dealing in blacksmith supplies. Iron spacers can either be bent up out of flat iron or castings made from a simple pattern. These hold



This sturdy press, with its pipe standards and simple parts, can be built at small cost of materials

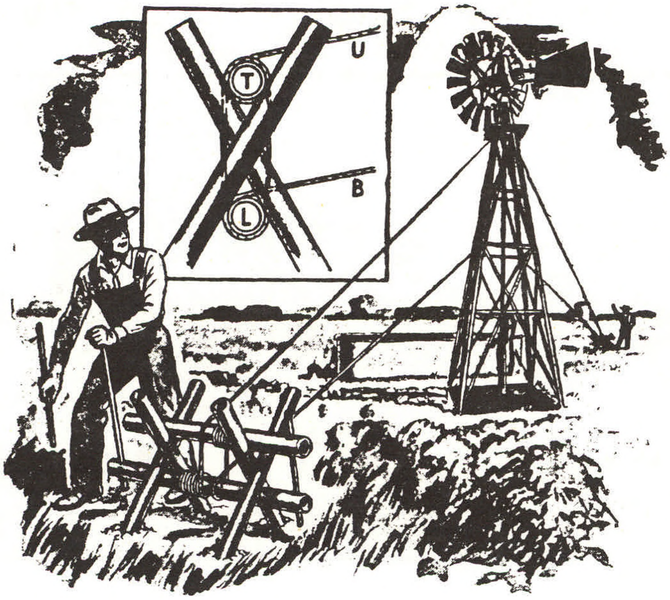
each pair of cross pieces apart the correct distance and also form a rough bearing that slides against the uprights. They are fastened to the cross pieces with short ½-in. bolts.

At the center of the upper cross piece is the nut, fastened with bolts that run clear through the whole assembly. This nut should be a bronze casting, although an iron nut can be used. The screw is turned up from good machinery steel to the size shown. The bottom end carries a swivel foot that remains stationary when the screw turns. Between the end of the screw and the inside swivel block should be placed a bronze disk to take up the pressure and allow the screw to turn freely.

The screw is turned by means of a ratchet device, illustrated in detail. The power applied to the handle is transferred through the slotted bushing and a key to the screw, as shown. The hand wheel on top is for setting the machine quickly and can be used for work that does not require any great pressure.

The ratchet, which works only in one direction, can be thrown out of action by pulling the latch back and turning it into a slot. This allows the screw to float free from all the parts. Parallels of square steel are used to support the work.—R. J.

Simple Adjustable Hitch Anchors Two Guy Wires



Two or more hitches may be needed for some types of work. In many cases a smaller size of pipe than illustrated may be used

ODDS and ends of scrap pipe can be combined to make a sturdy adjustable hitch for derrick, windmill, or other guy wires. Two X-members are formed by driving pipe into the ground. In the V's formed above and below are placed two short pieces of pipe, in which holes have been drilled for the tightening bar.

The lower guy *B* is brought in over the lower pipe *L*, around it, and up to the upper drum *T*, where it is wound up until the guy has the desired tension. The drum pipe is then secured by driving the turning rod downward until it engages behind the end of the lower drum piece. The upper guy is led over the upper pipe *T* and down to drum piece *L*, which is then turned until the guy has been given the right tension.

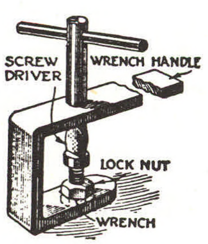
The same construction can be used for a hitch for a single guy wire.—ELTON STERRETT.

A Wrench for Lock Nuts

WHEN a number of screws have to be assembled with lock nuts, much time can be saved by using a combination screw-driver wrench like that shown. It is then not necessary to run the nuts on the screws first and back them again to the locking position. Another advantage is that the wrench acts as a guide for the screw driver.

The wrench is made of flat bar stock bent as shown, drilled to fit the screw driver shank, and filed hexagonally to fit the lock nut. The wrench is assembled on the screw-driver before the blade of the latter is flattened, so that the two pieces cannot come apart.

In operation, the lock nut is run on the end of the screw just enough to clear the end so that it can be started in the hole by hand. Then the wrench is slipped over the nut and held in the left hand while the right is used to turn the screw. As soon as the screw is in, a turn of the wrench will lock the nut tightly.—A. KENDALL.

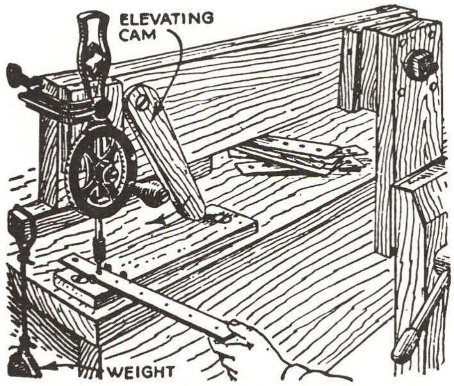


A special combination screw driver and wrench that speeds up the assembling of lock nuts and screws.

Small Drill Press Quickly Made for Emergency Use

IN AN emergency, when several hundred holes have to be drilled in sheet-brass parts, a drill press was quickly made from material on hand in my home workshop.

A 1¼-in. plank, 8 in. wide and 2 ft. long, was pivoted by means of a bolt and

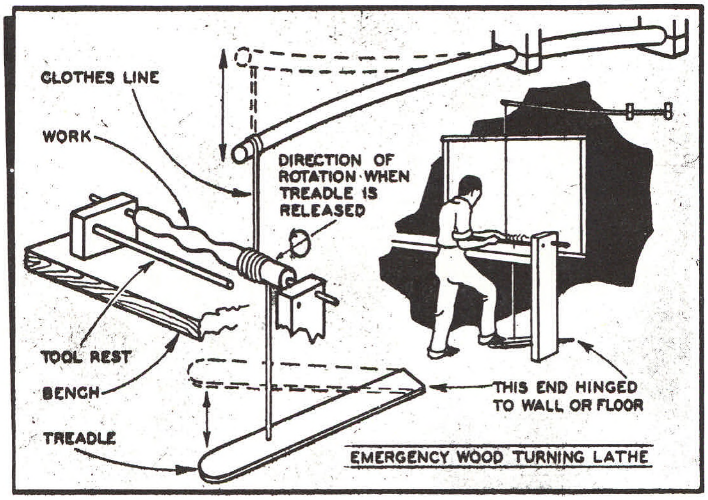


Hand drill clamped to pivoted plank provides means for doing light drilling speedily

wooden spacers to a shorter plank and the latter was gripped in the bench vise. A hand drill then was fastened to the free end of the longer plank with a C-clamp. An arm of thin wood pivoted as indicated to the long plank, served to elevate the drill, and a weight provided the necessary pressure for drilling.

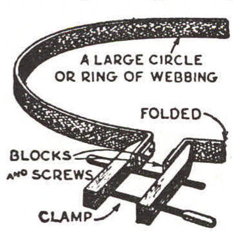
Easily Constructed Lathe Does Simple Turning Jobs

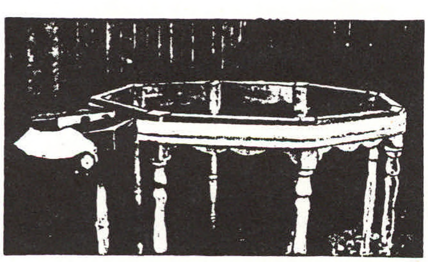
WHEN a simple turning job is necessary and no lathe is available, the arrangement shown at the right will furnish a satisfactory substitute. A pole approximately eight feet long and 1¾ inches in diameter is fastened to the ceiling at two points, as shown. A piece of clothesline is connected from the free end to a foot treadle. Two or three turns of the rope around the work will be sufficient to give the necessary traction. A piece of iron pipe serves as a tool rest.



STRONG WEBBING HELPS IN CLAMPING JOINTS

IN BUILDING furniture that is not rectangular in shape, the problem of clamping is often a difficult one. Recently, while making an octagon-shaped table, I got some furniture webbing, folded it through the center lengthwise, and fastened the ends to a hand screw with blocks and screws, leaving it long enough to reach around the framework when the clamp was open about 8 in. While the glued project is drying, a support should be placed under the clamp to keep it from sagging.—R. PUTZER.

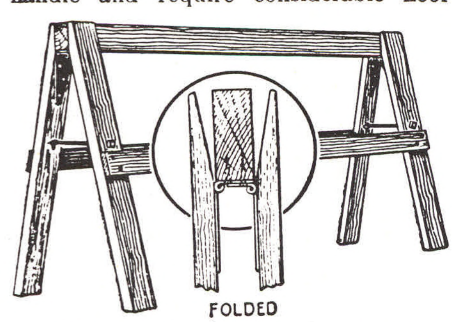




Clamping the framework of an octagonal table with a hand screw and band of heavy webbing

Folding Horses for Platforms

LARGE wooden horses for supporting platforms such as those used by millwrights and builders are cumbersome to handle and require considerable floor



When not in use, this large horse can be folded up compactly for storage

space for storage when not in use. The construction illustrated is designed to economize space. Incidentally, the horses are much easier to handle.

Large butt hinges are used to join the legs to the cross piece. When in use each pair of legs is held rigidly by a heavy iron hook.

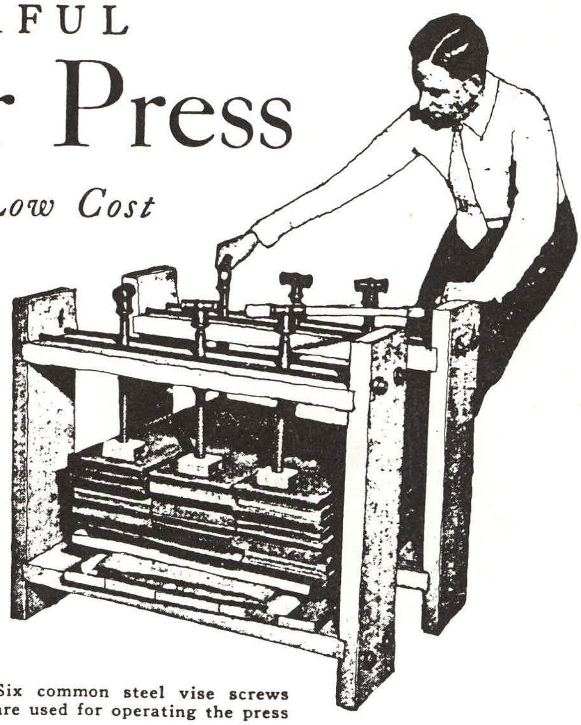
POWERFUL

Veneer Press

Built at Low Cost

VENEERING is generally recognized to be one of the most fascinating branches of woodworking, yet many amateurs hesitate to attempt it. That is partly because they think it very difficult and do not know exactly how it is done, but principally because they have no veneer press.

There are two good solutions to the veneer-press problem. One is to buy a special metal veneer press for panels up to 24 by 24 in. This press is very strong and convenient to use, as it has only one screw. If it had to be purchased on the ordinary commercial basis, it would be an expensive piece of equipment.



Six common steel vise screws are used for operating the press

The other solution, for those who do not wish to make so large an initial investment, is to build a press like that illustrated, which was designed by Albert Constantine, Jr. The hardware costs about   , and the lumber, depending upon the locality and whether it is bought in the rough or cut and dressed to the exact size, from   to   The reason this press is so inexpensive is because the screws are carpenter's steel vise screws, sold by all large hardware stores and general mail-order houses.

To construct the press, finish the four uprights accurately to size with all edges square and true, and cut dados (grooves) with the utmost accuracy as shown to receive the ends of the crossbeams. Bore ½-in. holes as indicated. Then prepare the crossbeams with equal care and bore the three 1-in. holes in each of the upper beams. On the underside of these two beams fasten the large nuts which come with the vise screws. The two units of the press may then be assembled and held by means of the steel rods. These run directly beneath the lower beams and directly above the upper beams. Use steel washers on the ends of each rod, and tighten the nuts with a wrench.

List of Materials

4 pc. kiln-dried maple 1¾ by 7¾ by 33 in. for crossbeams.

4 pc. kiln-dried maple 1¾ by 7¾ by 30 in. for uprights.

6 steel screws and nuts sold for making carpenter's vises.

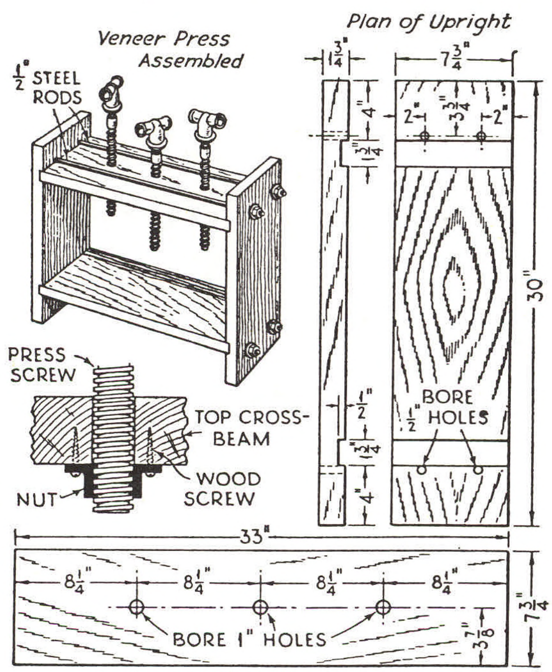
8 steel rods ½ in. in diameter, 40 in. long, threaded at both ends.

16 nuts and washers for the rods.

Note: Dimensions for the wooden parts are the finished sizes, the stock being dressed square and true on all four sides.

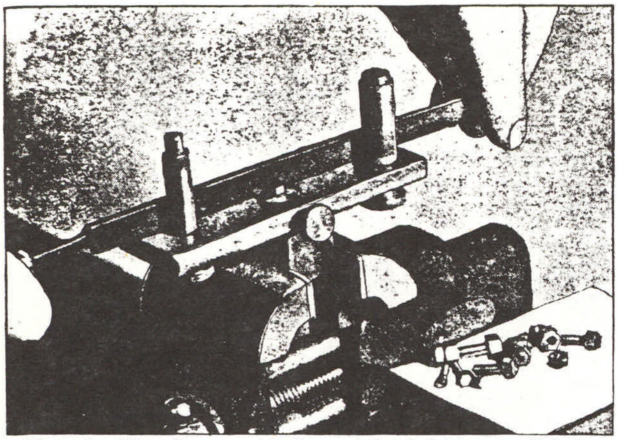
In use, do not place the frames farther apart than 14 in. Lay a perfectly flat 1- or 1½-in. board across the lower members of the frame; place the veneered panel or other work on this; set another heavy board on top; and tighten the screws evenly. Blocks of hard maple with a shallow 1-in. hole in each may be used as shoes under the ends of the screws; and, of course, if the work in the press is not high enough for the screws to reach it, any available wooden blocking may be used.

When longer pieces have to be veneered, an additional section can be built, although two sections are sufficient for most work an amateur is likely to undertake.



Sketch of one of the assembled units, drawings of the uprights and crossbeams, and how the nuts are fastened

Roller Guide Aids in Filing Small Nuts and Bolts for Models

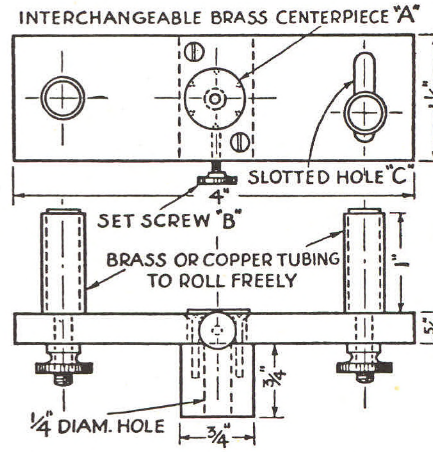


How the filing jig or guide is used for finishing small bolt-heads and nuts so that they will look workmanlike on a model

WELL-FINISHED and accurately made nuts and bolts add greatly to the attractiveness of a model engine or any other mechanical model, but hexagon nuts and bolts in the smaller sizes are both expensive and hard to obtain. A filing jig or guide that will make the production of accurate hexagons or squares a simple operation for the model builder is illustrated. This device was made from material found in the scrap box.

It is in reality a jig similar to those used in some factory operations. Two rollers guide the file and regulate the depth of cut. The brass centerpiece *A* is provided with a tapped hole in its exact center to receive the screw to be shaped. Shallow holes carefully spaced with a pair of dividers (six holes for hexagons, four for squares, etc.) are engaged by screw *B* and serve for indexing and locking the work while each face is filed. The slotted hole *C* allows one of the roller pins to be moved to suit work of various sizes.

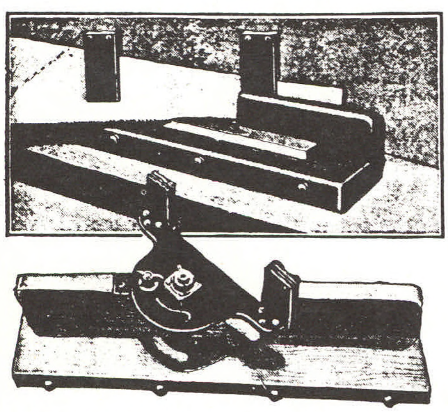
To make nuts, a threaded pin or stud is inserted in the tapped hole in *A*. Tapped blanks are then made from round stock, screwed on, and tightened with a pair of pliers.—W. CHUBB.



Working drawings of the filing jig. Set screw *B* engages indexing holes in centerpiece *A*

How to Construct an Adjustable Miter Box at Low Cost

By Roy C. Bradbury



The miter box in use and view showing the adjustable plate that carries the saw guides

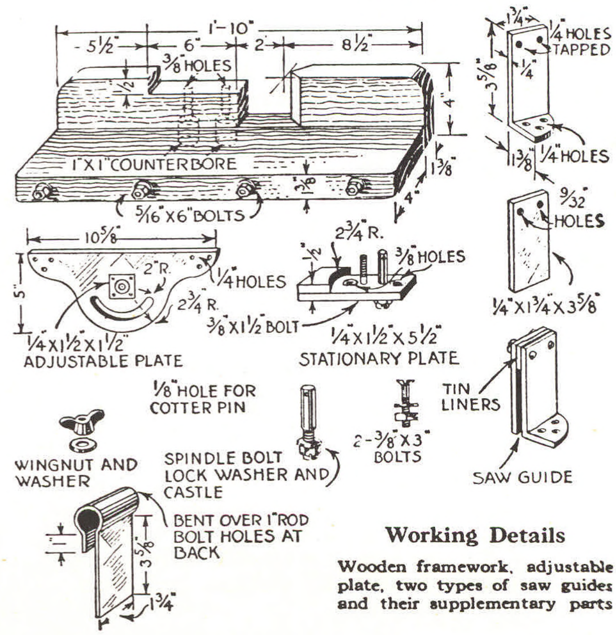
HOME workers who desire an accurate and practical tool at small expense will be interested in the accompanying photos and drawing of an adjustable miter box, which I recently constructed of scrap material and a few Ford parts. Such material may be found around almost any blacksmith or machine shop. The entire cost was 85 cents, including payment for some machine work on the saw guides.

In lieu of the channel-steel uprights for saw guides, a piece of ½ by 1¾ in. iron may be bent to the desired shape and squared up—this is very important—on a shaper. A machinist will do this work for a small sum. It also is essential that the uprights be square with the adjustable plate to which they are riveted at the bottom. However, if the riveting process should throw them a little "off," this can be remedied easily by catching the center of the plate in a strong vise and springing the ends with a monkey-wrench, for the adjustable plate is made of malleable iron. If wrought iron is used for the uprights, they should be casehardened. The same is true of the outer plates, which are bolted to the uprights and separated the thickness of the sawblade by small, thin liners. These pieces form the saw guides, and should be wear-resisting.

The center bearing of the adjustable plate also should be durable. This is assured by riveting a piece of wrought iron, ¼ by 1½ by 1½ in., in the center of the plate and drilling and reaming both pieces so that a Ford spindle bushing will barely start into the hole. The bushing then is pressed in with the vise, after which it is sawed, filed flush with the bottom of the plate, and reamed to fit a Ford spindle arm bolt.

The curved slot in the plate is scribed with a 2-in. radius from the center hole. A series of ⅜-in. holes is drilled and the

Continued



Working Details

Wooden framework, adjustable plate, two types of saw guides and their supplementary parts

slot then is filed to size as illustrated.

Next comes the stationary plate. This is made from ¼ by 1½ in. stock, 5½ in. long. Upon one end is riveted a 1¼-in.-long piece cut from the same bar. One of the 1½-in. edges of this piece is profiled to the arc of a circle of 2¾-in. radius, as detailed. The rivet holes must be countersunk on both sides. Two ⅜-in. holes, countersunk on the top or upper side, are drilled to receive the two home-made anchor bolts.

Before bolting down the plate, lay off and drill carefully the hole for the spindle-arm bolt. Saw off the head of the bolt and drill a ⅛-in. hole near the top; insert the bolt from the top side of plate, clamp the bolt in a strong vise between two pieces of soft wood, put on a lock washer, and tighten the castle nut.

The large plate now may be put in position temporarily, and the smaller plate laid off for the quadrant bolt. Drill the hole 23/64 in. and press in—from the under side of the stationary plate—a ⅜ by 1½ in. machine bolt. Two ⅜-in. washers and a ⅜-in. wingnut also are required.

BEFORE bolting down the stationary plate, scribe a line lengthwise in the exact center of the small plate, against its circular edge. Then, using a small, sharp cold chisel, the edge of which must be placed exactly on the line, cut into the metal deep enough to make an easily discernible line, but not too deep. With a flat file remove the burr thus made and level the top of the plate.

The construction of the two-piece oak frame is obvious. It must be remembered, however, that the two pieces *must be square with each other.* Long screws, of course, may be used instead of bolts, and the two anchor-bolt holes may be mortised at the bottom with a small wood chisel. My method was to bore the holes from the top, drive soft wooden pegs in from the bottom, and bore a 15/16-in. hole 1 in. into each hole, thus pocketing the nuts and washers.

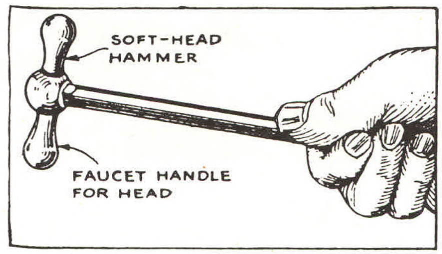
All parts of the tool should be assembled, the liners and flat plates, forming the saw guides, put on, and a panel saw shoved into the guides. Having completed this operation, mark the two 45-deg. angles and the 90-deg. angle on the adjustable plate. The head of a combination square is excellent for this purpose. *Accuracy is essential.*

ASCERTAIN by trial if the three marks on the plate are correct before cutting them too deep. Next, remove the pin and washers on the spindle bolt, take off the adjustable plate, clean all parts of the metal and wood, and give each two coats of paint, thinning the first coat with turpentine and allowing two days to dry before applying the second coat.

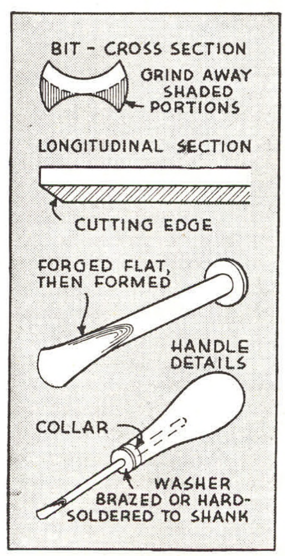
I used mahogany stain for the wood and automobile enamel for the metal, because these colors were handy. Almost any other colors would have done as well. One should be careful, however, to see to it that all surfaces are clean.

FAUCET HANDLE MAKES SMALL "SOFT HAMMER"

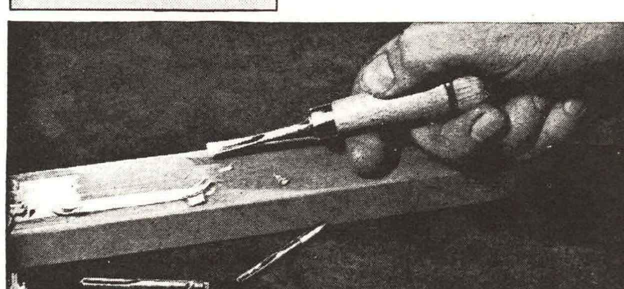
A SMALL hammer made of brass, copper, or lead is of great value in assembling or adjusting fine machinery. A hammer of this sort, small enough to be used for such delicate work as gun repairing, can be obtained without cost by fitting a suitable wooden handle to a brass T-handle taken from an old household water faucet.—V. A. L.



Old Drill Bits Are Easily Converted into Useful Woodworking Gouges



OLD straight-fluted drill bits can be converted into serviceable gouges. A simple method is to square the end of the bit, grind the sharp ridges to a C-shaped cross section, and sharpen the end to a cutting edge. Still another method is to heat the bits red, cooling them slowly, then reheating and forging the end to form a carving tool of the desired shape. Harden the gouge by heating it red and plunging it quickly into water. Polish the metal with an abrasive cloth; then temper by heating the end to a straw color, and again quenching.—W. E. B.

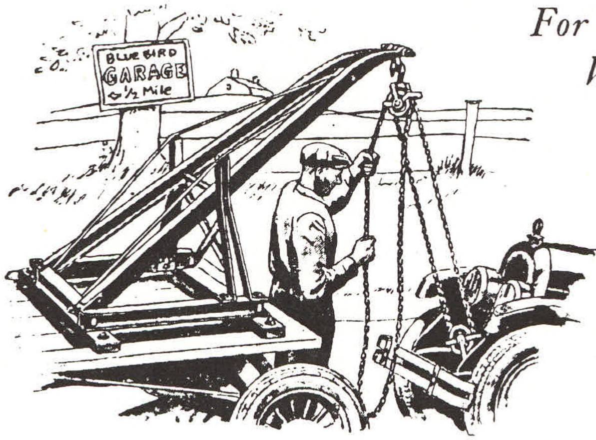


The gouge in use above was made from a drill of the type shown

Crane Built at Low Cost

For Use on Emergency Wrecking Car of Small Garage

By George H. Cappel



The frames of junked autos provide most of the material for this light wrecking crane, designed for garage use

SOME kind of a wrecking crane is almost a necessity in every commercial garage, large or small. Many establishments are able to purchase one of the rather elaborate cranes on the market, which, when mounted on a well-painted truck, makes a good moving advertisement of the garage.

The smaller garage man frequently contents himself with a wrecking car made from an old passenger vehicle, or sometimes a truck, without the advantage of a crane. With the equipment in the garage and material from scrapped frames, a mechanic can build a highly satisfactory crane for handling wrecked cars on the road or for use in the shop.

The hoist mechanism is a one-ton differential chain block. This is the least expensive type, and one is probably in use in the garage already. The main members of the crane, marked A in the drawing, are from the frame of a junked car. It is, of course, essential to have them heavy—the heavier the better. They are supported by other frame sections cut and formed as shown, and cross braced with 5/16 by 2 in. flat iron.

THE longitudinal frame members, marked C in the drawing, are attached to two other sections of old frame, E, making the entire crane self-contained so that it can be attached to the truck with four bolts in a short time, and removed when not needed.

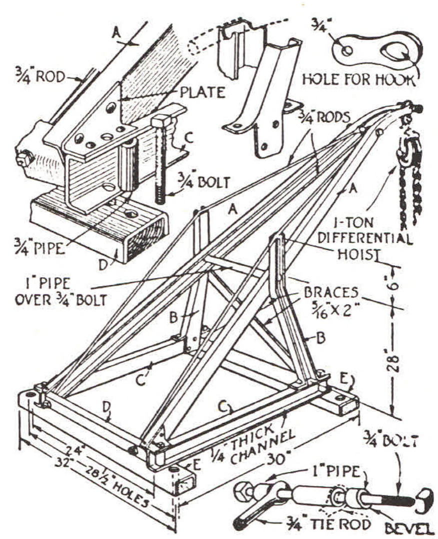
The inclined members A should be of such a length that the crane has an overhang of about 42 in., measured horizontally. It is well to lay out the parts on the floor before cutting or bending any of them in order to make best use of the material and insure suitable proportions.

Two ¾-in. rods are used to strengthen the inclined members. These can be attached with the same bolt that holds the link for the chain block, or a short distance below. They are passed through a cross piece, D, at the bottom, which is attached to the longitudinal members.

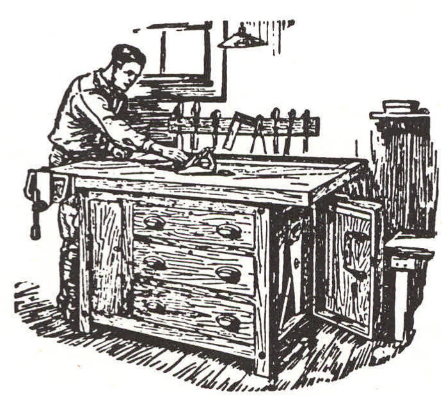
The cross members E are fitted with hardwood filler pieces. The longitudinal members are bolted to them with ¾-in. bolts, with a short length of pipe between the flanges to prevent distortion. These cross members should be about 32 in. long, and if the crane is to be used on a Ford truck, holes should be drilled on 28½ in. centers for bolting to the truck frame.

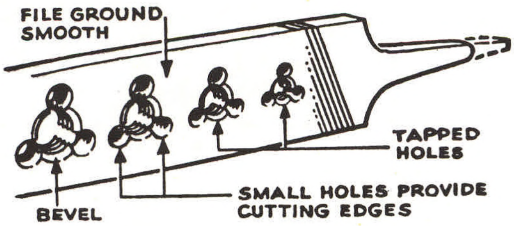
The inclined members are attached to the pieces B by means of a ¾-in. rod passing across, with a pipe over the rod so that it can be drawn up tight with nuts.

Riveted connections should be made with ½-in. rivets driven hot. Welding will be useful if done by a skilled welder.



How the crane is made, and suitable dimensions if it is to be mounted on a light truck

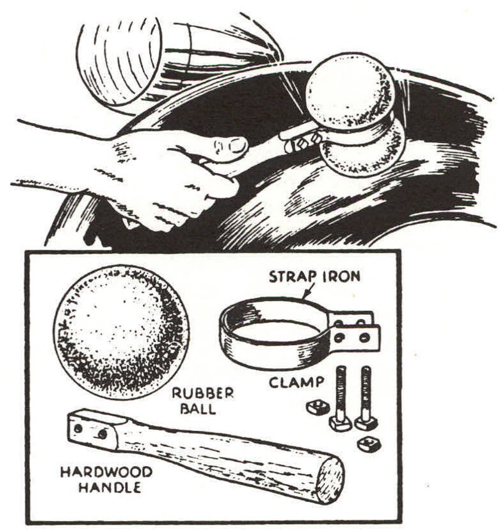




Old File Is Screw Plate. Taking little space in your toolbox, a screw plate made of an old file is handy when a number of different threads are required. Anneal the file by heating it cherry red and burying it in ashes, and grind off the teeth. Drill and tap to suit, using tap drills one size smaller than usual. Then drill three intersecting holes around each tapped one, first punching them carefully so they won't "fall in." Countersink the main holes slightly, reharden the file, and draw it to a light straw color.—H. E. POTT.

Rubber Fender Mallet Made from Toy Ball

A SERVICEABLE rubber mallet for repairing damaged fenders can be made for about fifteen cents. Buy a sponge-rubber ball about three inches in diameter at your neighborhood toy store. Drill two sets of holes in a strip of scrap iron and bend this around the ball. Insert long bolts into the holes and through the end of a hardwood handle as indicated in the drawing below. When the clamp is tightened, the ball will puff out at both ends to form a sturdy mallet.—H. A.



How the ball, clamp, and handle are assembled. A rubber band protects the pump hose at left

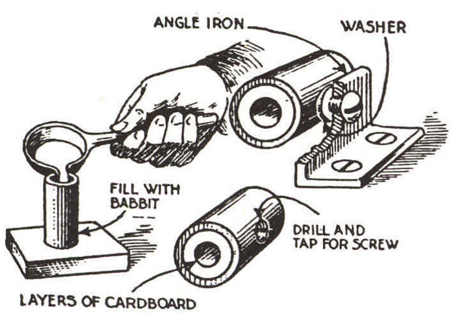
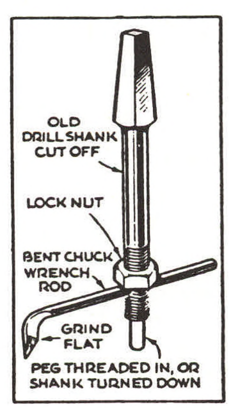


Fig. 8. Small universal bearings

SMALL machine bearings that can be mounted on surfaces of almost any shape and that are adapted to all sorts of positions, can be made quickly from ordinary gas- or water-pipe. Obtain pipe about ½ in. larger than the shafting for which the bearing is to be used, and saw off pieces 1 in. long or longer. Fill each with babbitt, place it in a lathe, face it off and drill for the shaft. Next, drill and tap a 3/16- or ¼-in. hole, as shown in Fig. 8, and mount the bearing on a short length of angle iron. Many combinations of bearings and angle irons are possible, and the construction is strong enough for light work.—C. F. KLINGER, Pittsburgh, Pa.



TOOL CUTS OUT LARGE HOLES

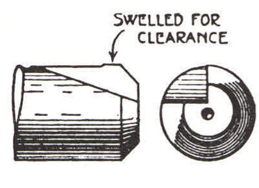
DIAL, meter, and socket holes can be made with this tool that cuts soft metal, hard rubber, plastic, and wood. An old drill shank is cut off, as indicated, and a hole is drilled in it for the cutting rod. It is threaded for a nut to lock the cutter at the radius needed for each job.—N. BOGOCH.

Simple Reamers Made with a File

By Judson de Graff

ONE of the most frequently encountered "stickers" in automobile-repair work is the odd-sized bushing which comes undersized and which shrinks still smaller during the operation of pressing it into the hole it is to occupy.

The usual procedure in the absence of a complete set of standard reamers is to lap away the surplus material with a strip of emery-cloth wrapped on a short length of rod or to scrape away with a three-cornered scraper until the hole is large enough so that the shaft or pin which is to be entered will slip through. Either method is unworkmanlike and unless it is carefully and slowly done it produces an uneven fit.



You can do an excellent job with this kind of reamer

The remedy is a simple one. It consists of constructing a reamer like that shown in the illustration, which may be made with a file.

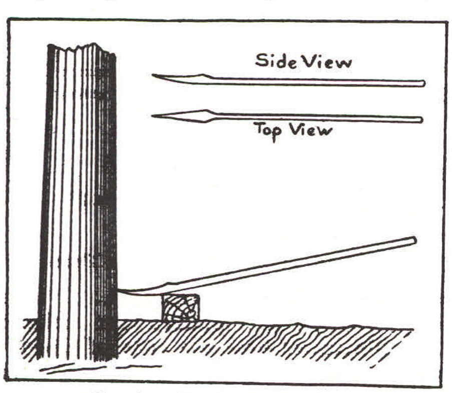
A piece of cold-rolled steel which is the same diameter as the finished size of the hole in the bushing, is deeply notched with a file, that side of the notch which is to be the cutting face being cut parallel to a plane drawn through the center, and parallel to the length of the piece. The corner should be chamfered the circumference of the shaft on the end, cutting deeper as the cut proceeds away from the cutting edge. This is to give the cutting point clearance the same as a drill or any other reamer.

On account of the fact that this style of tool cuts up along the side of the cutting lip as well as on the point, it is necessary to give this lip a slight clearance also. If this is not done, the tool will wedge in the hole. This is done with a few light blows with a punch on the edge of the cutting face. The metal which is thus forced out is then carefully dressed off and the tool case hardened by heating to a bright red and rolling in potassium-cyanide several times, followed by plunging it into cold water.

If the pin which worked in the original bushing is not to be used again and it is found to have an end which is not in the least worn, it makes ideal stock from which to make the reamer, for it is already the size needed. On account of the single cutting edge. the rest of the tool acts as a guide.

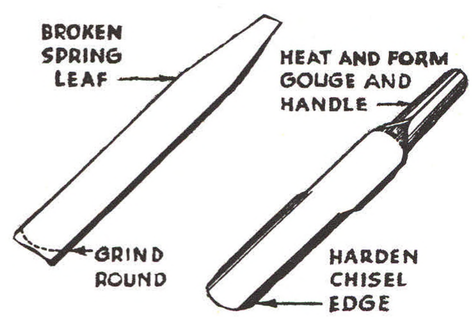
TOOL FOR PULLING POLES

An ordinary crowbar with the end drawn out and tempered as shown makes a good tool for pulling poles, says the American Telephone Journal. The point of the tool is



Crowbar Used to Pull Poles

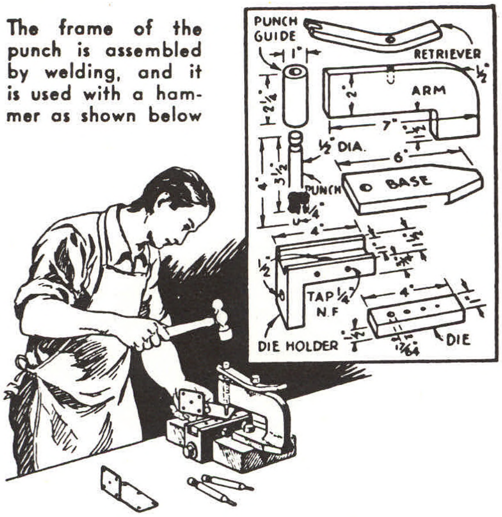
thrust into the pole near the base, and a block or other elevation serves as the fulcrum. With three of these tools poles 70 ft. long may be pulled and moved ahead 15 ft.



Big Chisel Forged from Spring

A KEEN, durable chisel, especially good for tree surgery, may be made from a broken auto spring leaf. Grind the broken end to the desired shape. Then in a forge or furnace soften the metal for blacksmithing into a gouge contour. At the other end of the spring section, roll the edges together to form a suitable shank for hammering. Before rehardening, rough-grind the chisel edge. Hone it sharp after hardening. Leave the rolled end soft.—*E. F. Lindsley, North Prairie, Wis.*

A Hammer-Operated Punch for Light Work



The frame of the punch is assembled by welding, and it is used with a hammer as shown below

IF OXYACETYLENE welding equipment is available, it is a comparatively simple matter to construct a small punch for making holes in spring steel up to 3/32" thick and mild steel 1/8" thick.

The arm is cut from a piece of 1/2" plate to the end of which is welded a piece of 1" shafting with a hole drilled through it to serve as a guide for the punch. It is best to drill the guide smaller than required, then weld it to the arm and, after it has cooled, drill the hole to the finished size.

To do the welding, place the pieces in position, heat both to a dark red, spot the guide to the arm at each end, then start at one end and weld the seam completely. Turn the work over and weld the other seam, beginning at the hottest end. A suitable base is then welded to the arm by following the same procedure. Use a No. 4 tip and 1/8" filler rod.

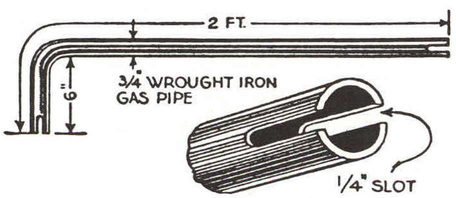
The die holder is a piece of mild steel bar bent to a right angle as shown and slotted to hold the die. The die is made from mild steel, or preferably a piece of key stock. It is drilled for whatever holes are most commonly required, but it is advisable to make them 1/64" larger than the holes to be punched. Two set screws hold the die in place. The die holder is mounted solidly on a bench block or a heavy piece of steel or cast iron. The punches are turned from cold-rolled stock and hardened by heating with the torch and plunging into oil.

To withdraw the punch from the work, it is necessary to provide a retriever on top of the arm as illustrated. The end of the retriever is struck to withdraw the punch.

Special Tool for Wing-Nuts and Petcocks

THIS tool for use in the garage while adjusting and oiling the car can be made of a 2-ft. length of gaspipe bent at one end and slotted with a saw at both ends, as is shown in the attached sketch.

This tool obviates the practice of reaching or crawling under the car to turn up



This tool will be found helpful for turning wing-nuts and petcocks

winged nuts provided for adjusting brake-bands or turning off stopcocks for the gasoline line or crankcase of the motor or the drain under the radiator or pump. The turning tool is also of advantage in turning up grease-cups of the type with a winged cup for the grease. This tool is readily made up in a few minutes and its use avoids soiled cuffs, coat sleeves, and clothing.

Rolled Screening Cleans Out Clogged and Dirty Files

FILES with the spaces between the teeth clogged from use are inefficient tools. Many a file which seems to cut slowly or leave a rough surface will do good work again when cleaned with a file brush.

If you don't happen to have a regular file brush, a piece of wire screening that is rolled up and scratched lengthwise along the teeth will do an excellent job. To prevent scratching your hands, place the screening in a cardboard tube or an empty shotgun shell, or wrap it up in several layers of friction tape.—FRANCIS L. TYLER.

IN REMOVING carbon from piston-ring grooves, a tool such as is shown in Fig. 7 comes in handy and saves considerable time and effort. An ordinary piston-ring compressing tool or a strip of cold rolled steel slightly wider than the groove and of sufficient stiffness is shaped to fit the piston. A piece of a file is annealed and allowed to cool slowly from a cherry red in the ashes of a fire. This is cut to fit the groove and fastened to the inside of the tool with a machine screw. When hardened, it serves well to scrape the edges of the groove.

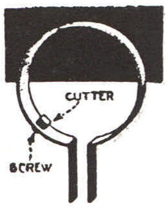
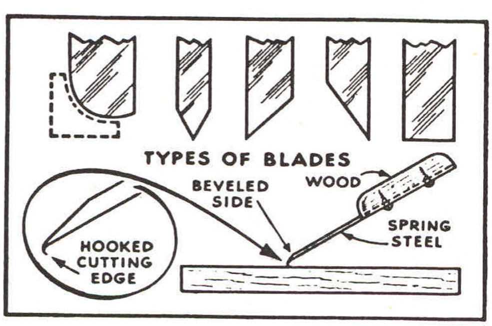


Fig. 7. Scraper for grooves

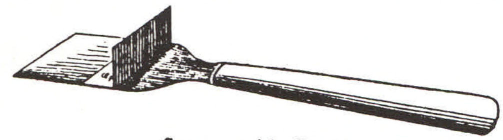


Spring Steel Used for Scrapers

WOODWORKERS who need scraper blades of various shapes for use on carvings and other intricate work may make their own from scraps of spring steel. After grinding the steel to the desired shape, sharpen it to a razor edge on a fine stone, being careful to keep the bevel on one side only. Then grasp the scraper blade firmly and force the cutting edge against a piece of hard steel in such a way that the edge is curled away from the bevel of the blade.—G. S. GADDA.

A HANDY SCRAPER

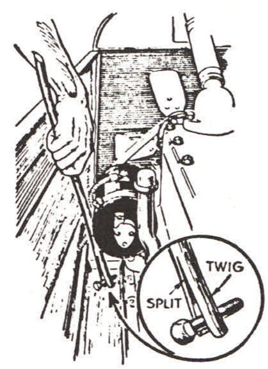
The drawing shows a useful scraper for removing scale, rust and paint from iron, wood, etc. The guard attached to the blade prevents chips and dust from flying into


Scraper with Guard

the eyes or down the sleeves of the person operating the tool. The particles hit the guard and fall below.—Contributed by W. A. Jaquythe, Richmond, Cal.

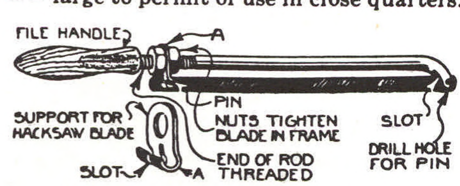
Split Stick Retrieves Bolts Dropped in Pan

SOMETIMES the simplest ways to do things around a car are the last ones thought of. I've often struggled to retrieve a bolt or nut that dropped down beside the motor of my car, but recently I stumbled on an easy and effective method. Merely split the end of a twig and use it as a long-handled clothespin to grab and lift the elusive part, as shown in the drawing at the left.—L. M.



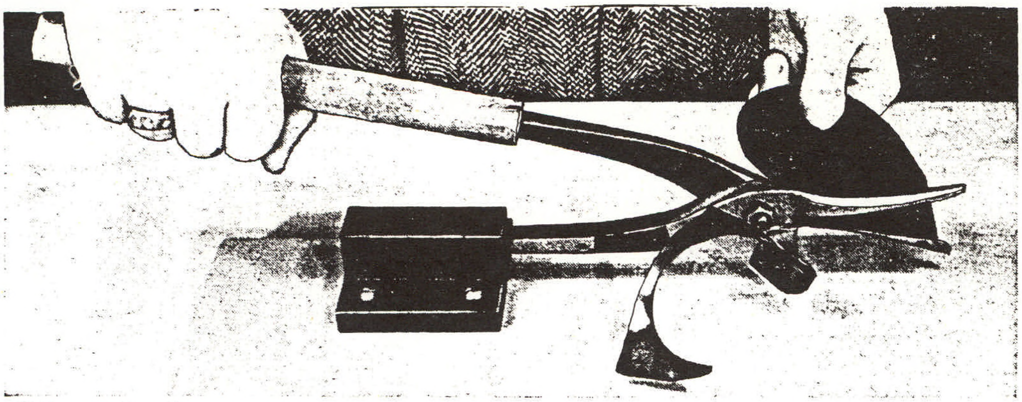
Special Saw-Frame Constructed for Restricted Space

HACKSAW frames are frequently too large to permit of use in close quarters.

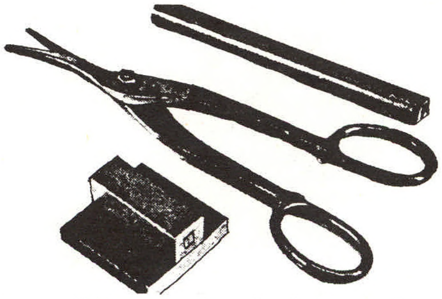


This improvised hacksaw frame will go into places where there is no room to use a full-size tool

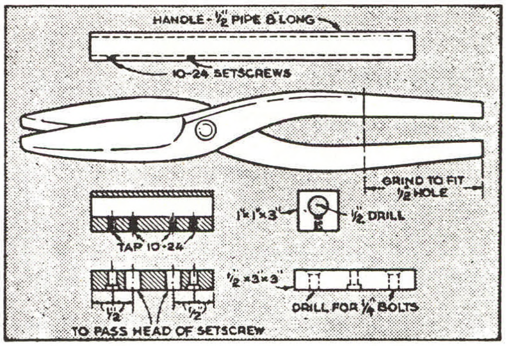
The frame shown is made of a piece of cold-rolled steel fitted with a file handle, and slotted at one end for the insertion of the blade. The opposite end of the blade is held by support secured by nuts threaded on the end of the rod.



While one hand exerts pressure downward, the other hand can guide the cut with accuracy.



Two steel blocks, a length of pipe, and a pair of good snips are the chief materials needed.

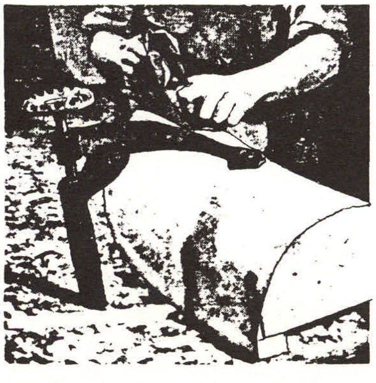


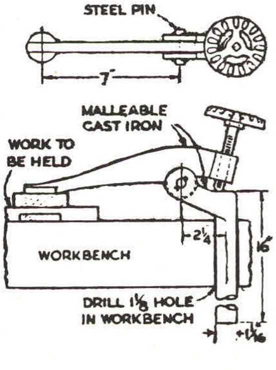
Tin Snips Converted to Bench Tool

Cutting sheet metal is a pleasure with these bench snips. Not only can you apply more pressure with less effort, but you can also guide the cut along layout lines with great accuracy. Obtain a good-sized, high-quality pair of tin snips and remove the handle loops (if they're hardened, save your hacksaw blades and use a grindstone or cut-off wheel). Work the ends down to fit a ½" hole. Drill a hole of this size through a 1" by 1" by 3" block, locating it a bit off center, and tap the four setscrew holes shown. Drill four matching holes in a base block, making the two inner holes large enough to clear the setscrews and counterboring the outer holes. Also drill and countersink holes in the base for mounting bolts.

Assemble the blocks with setscrews in the two outer holes, and secure one handle of the snips in the ½" hole with setscrews through the inner holes. A piece of ½" pipe is driven on the other handle to provide a grip and furnish enough leverage for easy cutting.—*Jack Mellinger, West Orange, N. J.*

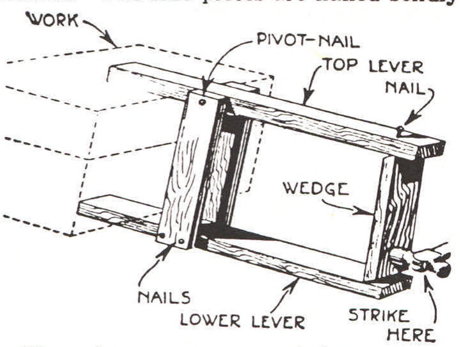
FOR HOLDING WORK OF AN IRREGULAR SHAPE, the bench clamp shown below is slipped into a hole in the bench and the screw is tightened. When not in use, it can be quickly removed, leaving the bench top clear and free from obstruction. The clamp in the photo and drawing below was designed by Sylvester C. Bohe, senior carpenter in the U. S. Bureau of Reclamation shops in Denver, Colo.





An Improvised Clamp for the Home Carpenter's Use

AN improvised clamp like that shown in the illustration may be made easily from scraps of wood and it will give satisfaction. The side pieces are nailed solidly



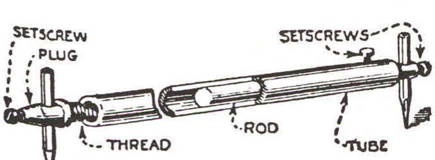
If you have no carpenters' clamp, you may improvise one as shown here

to the lower lever, while at the top only one nail is driven from each side. This permits the upper lever to swing on a pivot. A piece of wood is driven between the longer ends of the levers. As the longer ends of the levers spread apart, the shorter ends close, tightly clamping the work. A long nail may be driven through the long end of the swinging lever. This will act as a stop to prevent the wedge piece from moving when it is driven into place.

A clamp such as this will be just as satisfactory as a purchased one and will cost but a few minutes' time to make in your own workshop.—R. H. KASPER.

Rod and Tube Form Bar of Neat Trammel

FOR drawing large circles I have found very useful the bar compass or trammel shown. A threaded plug for holding a point, pen, or pencil, is screwed into the end of a tube of suitable diameter and length. A rod slides in this tube and at

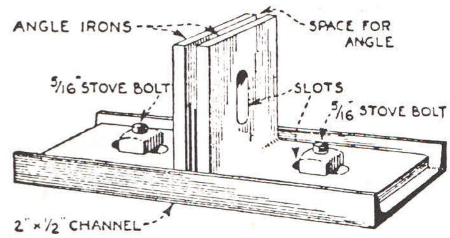


Adjustments are made by sliding the rod in and out of the tube

one end of it is a holder for the other point.

In setting the instrument, the rod and tube are telescoped or expanded the desired distance and locked by means of a setscrew.—J. H. MOORE, Toronto, Can.

Bench Fixture Saves Time in Laying Out Angle Irons

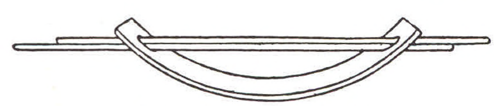


WHEN laying out small angle irons, difficulty is often found in holding them in place so the flat surface will be up.

A simple bench fixture can be rigged up to do this by fitting two pieces of 4 by 3 by 5/16-in. angle iron into a 2 by ½-in. channel, 9 in. long. The slotted holes in the legs allow adjustments to be made to accommodate angle irons of varying thickness. — O. W. MIELENZ, Philadelphia, Pa.

HANDY INSIDE CALIPERS

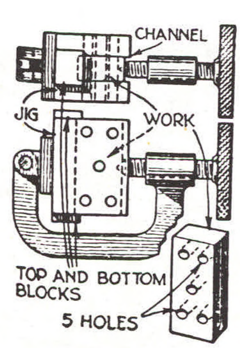
A pair of inside calipers can be made from a scrap of sheet steel (spring or tempered steel is the best) or from an old hacksaw blade. Enlarge or make a hole in



Calipers Made of Scrap Steel

each end which will allow two rods ⅛ in. in diameter to pass through. The pressure on the rods caused by the spring will be sufficient to hold them firm. They can be adjusted to any inside diameter and the distance measured, while they are still in place, by a rule; or, better still, the rods can have inch marks filed on them.

Quick-Acting Hinged Jig

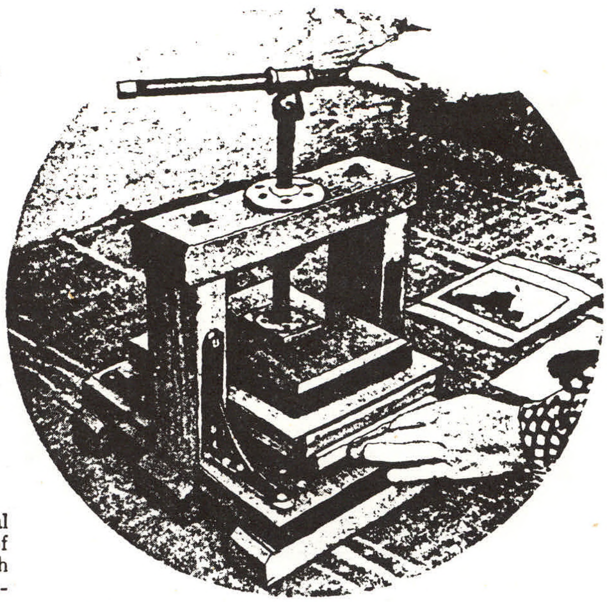


A jig for drilling

FOR drilling five holes in the small block, a hinged drill jig was devised as illustrated. The work fits in a channel section that is provided with guide holes and is clamped with the knurled screw. The jig is swung open for cleaning and loading. — FRANK N. COAKLEY.

Utility Press

FOR BLOCK PRINTING



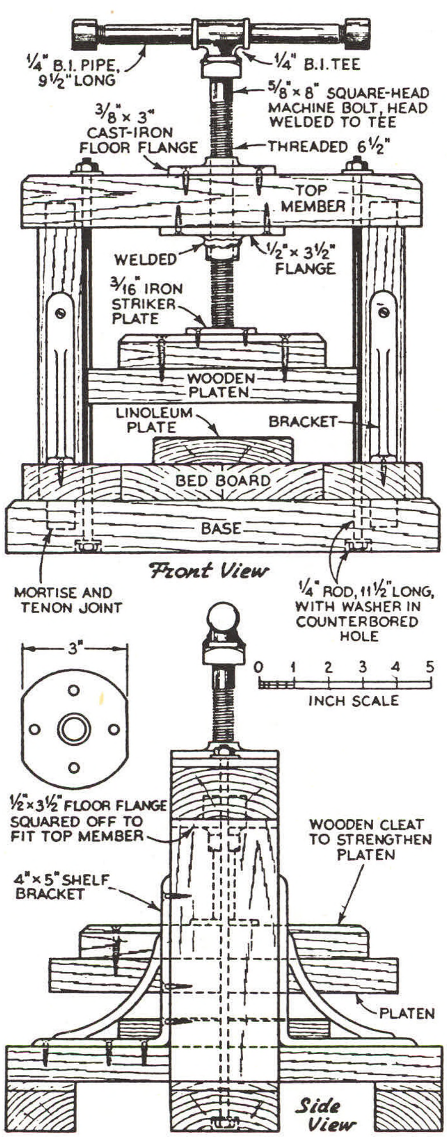
Making a print from a linoleum block. The bottom of the platen is padded with cloth thumb-tacked to the ends

THE design of this practical screw press is the result of considerable experience and much experimentation in the use of various types of presses for linoleum-block printing, bookbinding, veneering small panels, making inlaid pictures, and other gluing and pressing operations. The bed will take work measuring 7 by 10 in. or smaller.

Either oak or maple is used for the wooden parts, and the total cost should not exceed dollars. The entire assembly is screwed and bolted together. Glue is used for the mortise and tenon joints, and four shelf brackets stabilize the side supports.

The working drawings show the size and position of all members, and the list of materials has been determined from actual working conditions. Only two suggestions are necessary to assist the novice. First, the two outside bed boards are to be scribed and cut to fit tightly around the side supports; second, the platen is to be grooved at the center of either side deep enough to form a guide working against the ¼-in. rods.

It is an excellent plan to oil, varnish, or shellac the wooden parts.—W. W. WHEATLY.



List of Materials

2 pc. 1½ by 2 by 12½ in., for outside bottom supports.
1 pc. 1½ by 3 by 12½ in., for middle bottom support.
4 pcs. 1 by 2⅞ by 12½ in., for bed.
2 pcs. 1¼ by 3 by 9½ in., for side supports.
1 pc. 1½ by 3 by 11½ in., for top member.
1 pc. 1 by 7¾ by 10 in., for platen.
1 pc. 1 by 6 by 8¼ in., for platen cleat.

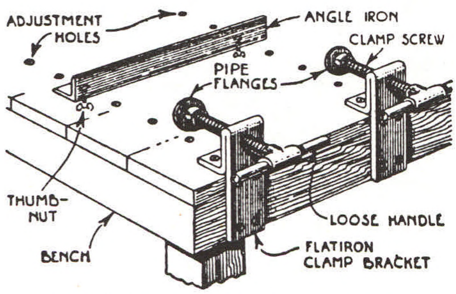
NOTE: This material is either oak or maple.

2—11½ by ¼-in. hex-head rods, with washers and nuts.
4—4 by 5-in. wrought steel japanned shelf brackets with 24 flathead black wood screws, ¾-in. No. 6.
1—8 by ⅝-in. squarehead machine bolt, threaded 6½ in., with nut.
1—½ by 3½-in. cast-iron floor flange, to be welded to ⅝-in. machine-bolt nut.
1—⅜ by 3-in. cast-iron floor flange, reamed to form collar for bolt.
1—¼-in. black iron tee reamed to receive ¼-in. pipe handle and welded to head of ⅝-in. machine bolt.
1—¼ by 9½-in. black iron pipe, threaded both ends for handle.
2—¼-in. black iron pipe caps, for handle ends.
1—2 by 3/16-in. flat iron for striker plate, drilled and countersunk for four No. 6 flathead wood screws.
24—1¾-in. No. 6 flathead bright wood screws, to fasten bed to bottom support; 6—⅝-in. No. 6 screws, for striker plate and ⅜-in. floor flange; 4—¾-in. No. 6 screws, for ½-in. floor flange; and 4—1½-in. No. 6 screws, to fasten platen cleat to platen.

Bench Vise for Carpenter Has Wide Range of Adjustment

By G. A. Luers

THE bench attachment illustrated has several advantages over clamps and the usual woodworker's vise for certain classes of work. This construction, as devised by a Washington mechanic, consists of a 2-ft. length of angle iron, with a hole drilled through each end. These holes correspond to holes drilled in two rows across the bench



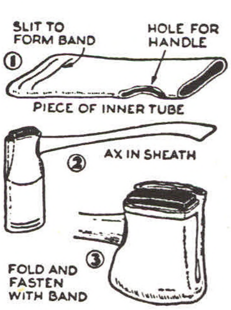
A useful fixture for the home workshop

top. Two through bolts with wingnuts are the means of securing the angle to the bench.

At the edge of the bench two clamping fixtures are secured as shown. They are simply pieces of strap iron bolted on; the upper end of each is drilled and tapped for a clamp bolt. A flange on the end of each screw prevents the point damaging the wood.

This vise has a wide range of usefulness for sawing, planing, and holding parts while nailing, gluing, and the like.

Heavy-Duty Ax Sheath Cut from Inner Tube



FOR an ax sheath, I've never found anything more satisfactory than the one shown in the accompanying sketches. It was cobbled out of an old piece of heavy inner tube after I'd lost a combination metal and leather sheath on a hunting trip. Cut the tube twice the length of the ax blade and make the hole for the handle as indicated. Draw the blade inside the piece of tube, which is then folded over the cutting edge and fastened with a rubber band that is part of the inner-tube sheath itself.—JOHN EDWIN HOGG.

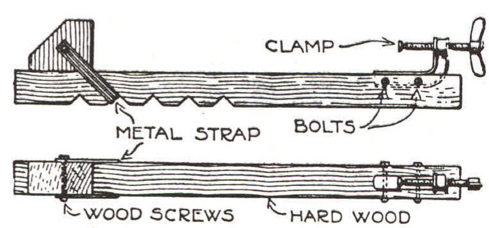
A DENTIST'S FILE

Some of the readers of the Quarterly may be interested, as I was, in a little stunt which a dentist friend of mine does once in a while and which is well worth knowing by any mechanic. This dentist occasionally comes upon a tight place in which to work and finds that he has no cutting instrument that will exactly answer his purpose. When a file or tool of that nature is required he stops his mining operations in the patient's mouth for a few minutes and makes a file in this manner: He takes a piece of piano wire of whatever size he wants, say $\frac{1}{32}$-in. diameter, lays it on a piece of softer metal, and with a fine chisel cuts teeth on one face for a quarter inch or so. Then he heats the wire in a gas flame and quenches it in mercury, giving him a file as hard as glass and to suit his particular requirement. If a flat or curved file is wanted, it is easy to give it that shape before hardening.—Contributed by D. A. Hampson, Middletown, N. Y.

An Extension Clamp for the Amateur Carpenter

AN extension clamp is desired by every home carpenter, but he has been prevented from buying it on account of its high cost.

One is easily made, however, from a broken C clamp. With this, all that



Constructing the extension clamp shown here will save you buying the expensive manufactured article

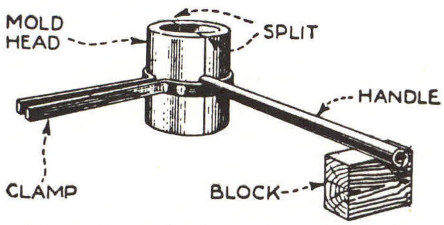
is needed are two pieces of hardwood, two $\frac{3}{8}$-in. bolts, two head screws, and a piece of metal strap. By following the accompanying illustration the clamp can be made in a very short time and will give good service for years.

Dimensions cannot be given, since the clamps come in assorted sizes; but they are unnecessary, for the clamp itself can be used and the rest of the contrivance may be made in proportion.—O. J. THIELHART.

Casting a Soft Hammer

FOR assembling machinery and tools, the old-time soft hammer seems almost a necessity. In order to have a supply on hand, and at a low cost, we made up several sizes of molds for casting them ourselves.

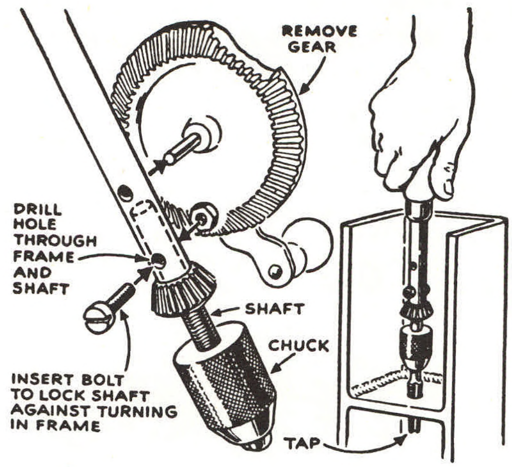
The handles are short lengths of ¼, ½, or ¾ in. pipe with the end split and bent



The handle, which is a piece of pipe, is inserted in the mold before the lead is poured

out to stay securely in the soft metal. The molds for the heads are pieces of pipe, 1, 1½ or 2 in., depending on the weight desired; these are split and provided with a hole for the insertion of the handle. For each mold a clamp is made of light bar iron.

Most of the hammers are cast of commercial lead, which is the softest and also the cheapest. For harder hammers, babbitt metal may be used.—W. C. C.



Old Hand Drill Is Converted to a Special Tap Wrench

A LONG-HANDLED tap wrench adapted to threading holes in hard-to-reach places may be made from a small hand drill that is rendered useless by a worn or broken gear.

To convert the drill, remove the crank and gear; then lock the chuck by drilling through the frame and shaft and inserting a small bolt. This prevents the shaft from turning independently, allowing the chuck to be rotated by the handle.—J. M.

Dowel Holes Bored Straight with Aid of Wooden Jig

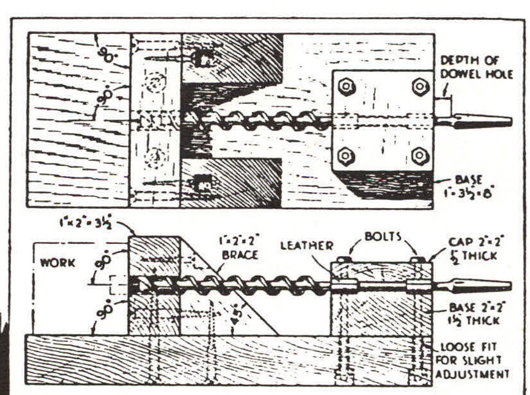
IN ORDER to bore a number of dowel holes accurately by hand in hard maple, I constructed the jig illustrated, which resembles a miter box.

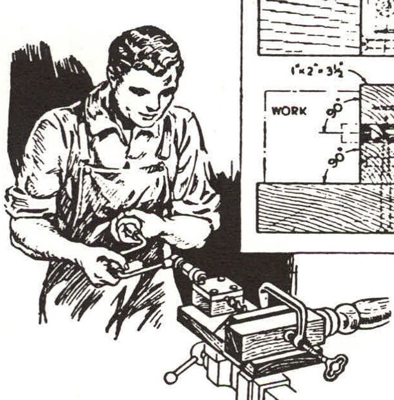
The guide for the bit shank consists of matching slots cut in the base and cap of the bearing. At the front and back more wood is gouged out so two pieces of leather can be wrapped around the shank and inserted as shown. When the cap is tightened on the oiled leather, the bit is held straight, yet can be turned easily with the brace.

Allowance is made for the travel of the bit so that when the jaw of the brace chuck comes up to the bearing block, the hole is just the right depth. Paper shims under the base of the bearing may be used to adjust the bit if it is not quite parallel, or the whole bearing may be twisted slightly if it is out in the other direction.

It is best to mark the wood to be bored with an awl at the point where the spur of the bit is to enter. By holding the work in the left hand a little away from the fence, the spur can be entered and set with one turn. The work is then set tight against the fence and pushed down against the base.

A cleat may be fastened to the bottom, if more convenient, and the whole jig clamped in a vise.—CHARLES M. GREEN.



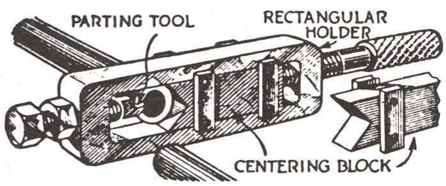


If a cleat is added underneath, the jig may be set up in a vise. Ordinarily the work may be held by hand, but a C-clamp may be used if necessary as at the left

Special Cutter Severs Light Tubing without Distortion

WHEEL type cutters, although very useful on standard pipe, are apt to be unsatisfactory on thin brass or steel tubing, as the tube tends to collapse under the pressure.

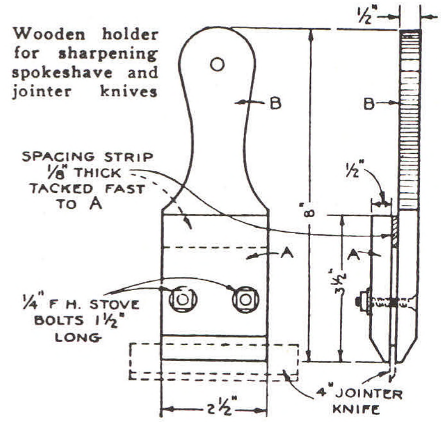
One shop having much light tubing to cut made the device illustrated, which severs the tube with a thin parting tool. The body of the holder is of rectangular



The thin brass or steel tubing is cut quickly and smoothly with a parting tool set in a special holder held in position with locknut

steel, with a threaded hole at each end, one for the tool and the other for the handle. A centering block is guided within the body and serves to force the tube against the tool. The tool itself is formed on the end of a tool-steel screw so that it may be removed for sharpening. It is held in the desired position by means of a locknut.—G. A. LUERS.

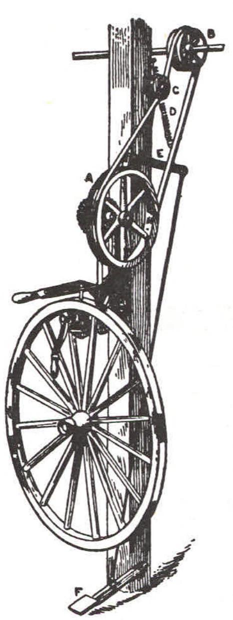
HANDLE HOLDS JOINTER KNIVES FOR HONING



MOST home workshops do not have facilities for grinding small jointer knives accurately, but the knives can be kept in good condition by honing them occasionally on an oilstone. As they are awkward things to handle, I made a clamp of hardwood, as shown, to hold them. It is equally useful for holding spokeshave cutters for sharpening.—H. N. ROWLAND.

A HANDY TIRE BOLTER

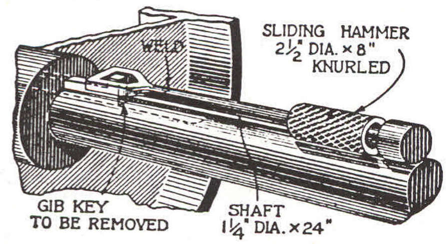
Twice the amount of work one can do by hand can be done by the use of the tire bolter here shown, says a correspondent of the Blacksmith and Wheelwright. The machine is run with a 1½-in. loose belt and a tightener and a 5-hp. gasoline engine for power. Referring to the figure: A is a 16-in. pulley with a 3-in. face and two bands of 1x¼-in. iron shrunk around the edge of the wheel to keep the belt from slipping. B is an 8-in. drive pulley with a 4-in. face. C is the tightening pulley, 3 in. in diameter and having a 4-in. face with a flange on each edge. D is a spring that regulates the tightener and the brake. E is the brake that prevents the machine from turning when not at work. F is the treadle which is used to regulate the speed.



Tool with Sliding Hammer Removes Gib Head Keys

GIB head keys are much easier to remove than those without heads, provided one is able to drive against the head. However, when the key is in a webbed pulley or gear, there is no opportunity to drive them out in the usual manner.

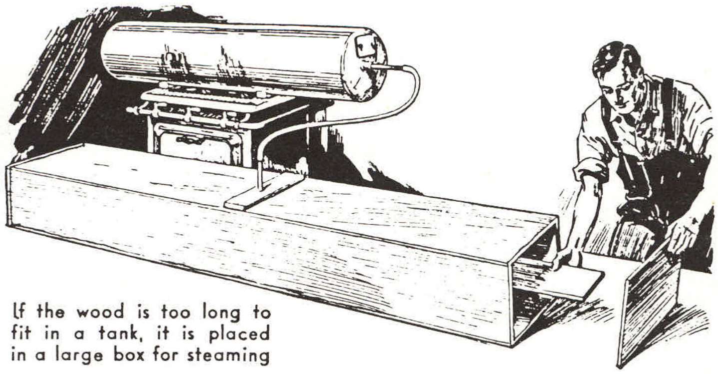
To take care of such conditions we made the key puller illustrated. At one end of



A powerful key remover for gib head keys that cannot be driven out easily by sledging

a bar an eye was forged that would fit over the gib head, while at the other end was a solid head. Sliding between, on the body of the bar, was a piece of shafting that served as a hammer. With the eye hooked over the head, the hammer was slid back and forth over the bar, striking the solid head, and quickly pulling out the key.—ANTON ZUPANCIC, JR.

Discarded Hot-Water Tank Serves for Steaming Wood



If the wood is too long to fit in a tank, it is placed in a large box for steaming

FOR steaming wood preparatory to bending it, the arrangement illustrated has proved satisfactory in boat repair work during many years past. All that is needed is a discarded hot-water tank, some pipe fittings, lumber, a garden hose, and a source of heat—in this case an old gas range.

Have a hole cut in one end of the tank as shown and make a suitable cover. This may be a piece of 12-gauge sheet metal large enough to overlap about ½" on all sides of the opening. Drill and tap two holes in the tank so the cover can be bolted in place with a rubber gasket cut from an old inner tube. The other outlets in the tank may be plugged with metal plugs or ordinary wooden plugs.

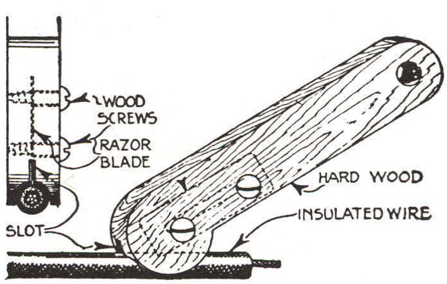
If the wood to be steamed is short enough to go into the tank, simply fill the tank half full of water and let the wood float in the water. Fasten the cover loosely enough so that some of the steam can escape. Do not under any circumstances let the pressure build up so as to run any risk of an explosion. Leave the wood to be boiled and steamed for at least two hours; then fish it out and bend it quickly before it can cool.

When the wood is too long for the tank, build a wooden steam box as illustrated. The wood is inserted from one end and a cover is nailed on. Connect the box with the hot-water tank by means of a rubber garden hose. This is done by inserting a ½" reducer in place of one of the plugs in the tank, and fastening a length of pipe to it; then thrust another length of pipe into a hole in the center of the steam box.—MATHEW DEBEVIC.

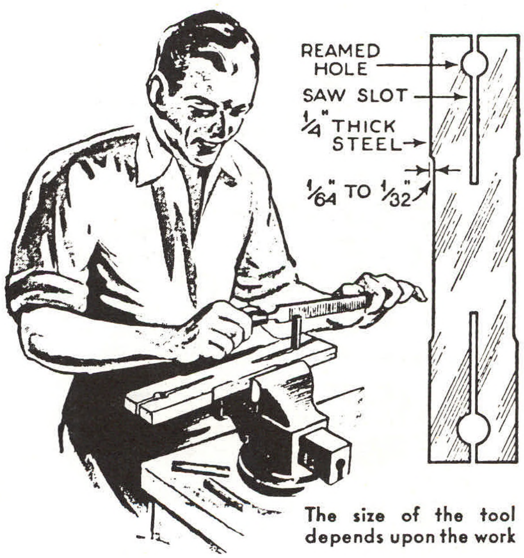
Stripping Off Insulation with a Razor-Blade

REMOVING the covering from electric wires for splicing purposes is slow and tedious work when done with a knife, especially if there is very much of it. The tool shown in the accompanying illustration, if carefully made, will render the task much easier.

A piece of hard wood is cut to the shape shown and slotted so as to slide over the wire. A saw kerf is made through the head, into which the blade is slipped and fastened with small bolts. In use, the stripper is drawn, with slight pressure, over the insulation to be cut away, splitting the rubber so that it may be removed with none of the usual trouble of scraping.—W. E. KING.



How the stripper is made and the method of using it to split off rubber insulation



The size of the tool depends upon the work

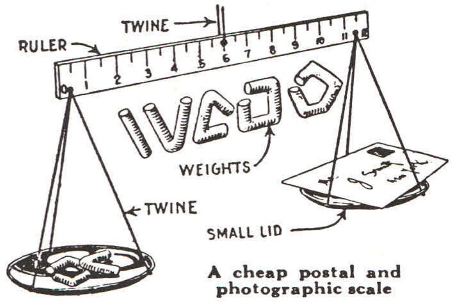
A Heavy-Duty Pin Vise

WHEN a number of steel pins of certain standard sizes have to be filed, cut off, or slotted, it pays to make a rugged pin vise of the type shown above. Holes for pins should be drilled and reamed, and the stock should be slotted and also recessed slightly on both edges as indicated for use in a machinist's vise.—PETER F. ROSSMAN.

Small Scale and Weights Quickly Made for Home Use

BRASS wire or rod, a ruler, and two tin lids are all that is required to make this simple scale for postal or photographic uses or for weighing small amounts in the home workshop.

The weights are made by obtaining a piece of wire that weighs exactly a certain number of grains and dividing it into pro-



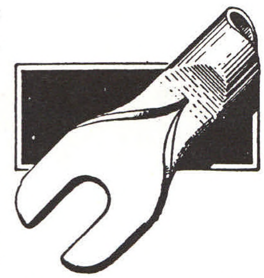
A cheap postal and photographic scale

portional parts. A piece of rod is similarly cut up to represent ounces. The shape of each piece indicates its weight.

The scale is a balanced ruler or a bar with two small lids attached to its ends with string, to serve as pans.—F. C. D.

How to Fashion a Wrench from Steel Tubing

ODDS and ends of steel pipe or cold-drawn tubing are good material for wrenches, the making of which does not present great difficulties. Take a piece of steel pipe or tubing and split it at one end for a distance of a few inches. Hammer the split portion out flat as shown in the picture, and then cut out a slot which will fit the particular kind of nut for which you wish to use the wrench.



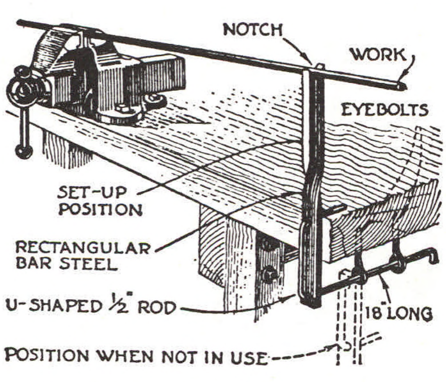
Discarded ends of tubing can be made into useful wrenches

You can easily make for your shop or garage a number of such wrenches fitting a variety of nuts. The cost is insignificant and the making of the wrenches requires little time, labor, and skill.—J. H. MOORE.

Auxiliary Support for Work Held in Vise

WHEN there is a long piece of work to be held in a vise, the machinist sometimes piles up boxes, pulleys, or anything at hand to support the end of it.

The accompanying illustration shows a support for such work that is always



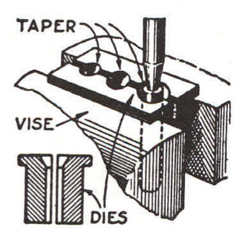
How the support, which disappears under the bench when not in use, steadies a long rod

handy when wanted, but never in the way. It is arranged to swing down when not in use. The bar with the notch at its upper end is made of ⅜ by 2 in. flat stock twisted as shown. Two holes are drilled in it for the U-shaped ½-in. rod. One end of the bent rod rests on the top of the bench when the support is in the raised position and effectively locks it in place.

The dotted lines show the support when lowered and pushed out of the way under the bench.—H. MOORE.

Punch and Die Set for Bellmouthing Tubing

AUTO repair men and other mechanics who make many repairs or new installations in brass or copper tubing will find the little punch and die set illustrated a handy and useful combination for producing uniform bell mouths for joints. It consists of a pair of steel blocks, machined as shown, and a taper punch.



The die, with the tube in place, is held firmly between the jaws of a heavy vise.

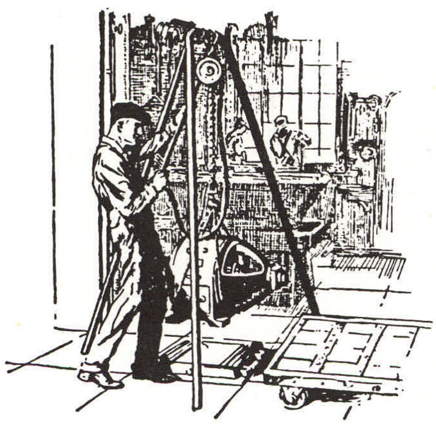
The blocks are made with a step on the side to prevent their slipping down when clamped in the vise. The holes in the blocks are drilled to fit the outside diameter of the tube and are countersunk to a depth of ¼ in., at any angle desired. Other sizes may be provided for in the one set by making the blocks correspondingly larger.

The space between the blocks should be from 1/32 to 1/16 in. when holding the tube. In use, the blocks are placed over the tube so that about ⅛ in. of the tubing projects, and are gripped with light pressure in the bench vise. The taper punch is inserted in the tube and tapped down with a hammer.—H. L. WHEELER.

Portable Crane for Use in Yard or Shop

PRACTICALLY one of the simplest types of portable cranes that can be rigged up for use about the shop or shop-yard consists of a tripod support.

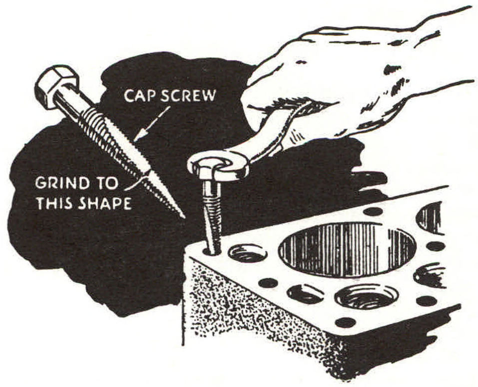
The material used in this construction consists only of three lengths of wrought-



Portable tripod cranes are suitable for a small shop because they can be folded up

iron pipe threaded at one end and screwed into a pipe T. The pipe is bent after being screwed solidly into place to bring the props about 4 or 5 ft. apart at the base.

With a block and tackle or small chain hoist lashed to the pipe T, this portable crane is readily lifted about from place to place.—G. A. LUERS.



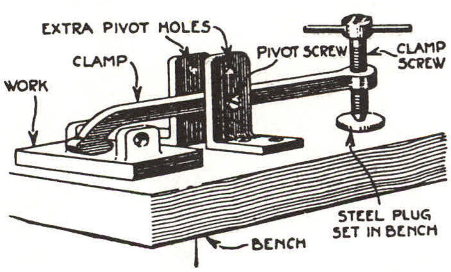
Dirt and corrosion are removed from studs holes of an engine by the use of this homemade device. It consists of a cap screw filed to a long point

Pointed Bolt Cleans Out Threads

BREAKAGE of cylinder-head studs when they are being replaced after an overhaul job can be eliminated by cleaning out the threaded holes in the cylinder block. Take a bolt or cap screw of the same thread size as the studs, and file or grind it to a long bevel point. When turned into the hole, this reams out all dirt and corrosion that would cause the regular studs to stick and break.—A. H. W.

Quick-Acting Bench-Clamp for Awkward Pieces

AN adjustable quick-acting clamp, particularly useful for holding irregularly shaped pieces, may be made as shown in the illustration. The nose of the clamp-



This clamp holds irregular pieces firmly

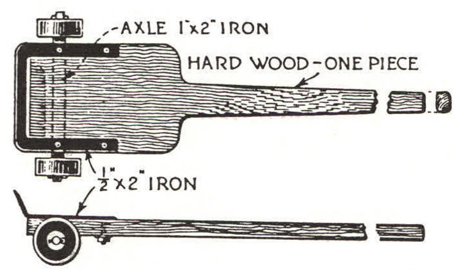
ing-bar is so shaped that it will go between bosses, lugs, or other obstructions.

The pivot screw is threaded to fit a tapped hole in one angle-iron, but is merely a straight fit in the other angle. By tightening the clamp screw great pressure can be exerted on the nose of the clamp. If the work is very thick, the pivot is moved up to the higher holes.—J. H. MOORE.

Handy Shop Floor Truck

HAND trucks of the conventional type used in many machine shops are sometimes more of a nuisance than a utility. Much of the light trucking about the shop can be done with a smaller truck that can be tucked away conveniently in a corner or other out-of-the-way place when not in use.

The truck illustrated is inexpensive and easily made, yet is strong enough to stand rough usage and carry loads up to



This sturdy little truck for shop use is made of a single piece of hard wood mounted on two wheels, which are made of cast-iron

200 pounds. It is quick and easily handled and takes up little room when not in use.

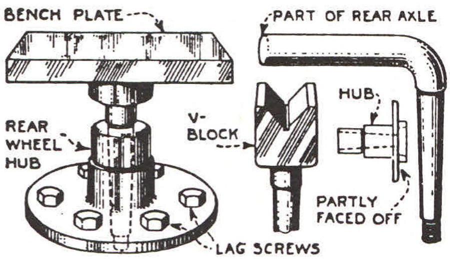
The body is made of maple in one piece. The axle is a piece of 1 by 2 in. iron with journals for the wheels turned on the ends. It is attached to the body with carriage bolts, and nuts and lock washers on the under side.

Cast-iron wheels about 4 in. in diameter are fastened to the journals with washers and cotter pins. The lip is made of ½ by 2 in. iron twisted and bent as shown and attached to the body with lagscrews

Old Auto Hub Serves as Useful Bench Fixture

WORN out and discarded auto parts often can be worked up into serviceable tools for the home workshop. A handy fixture of this kind is illustrated.

A rear wheel hub from a smashed wheel is obtained and the side carrying the hub cap is faced off flush with the surface of the flange. This leaves the main part of the hub with a tapered bore, into which



A rear wheel hub forms swivel mounting for bench plate, V-block, and riveting anvil

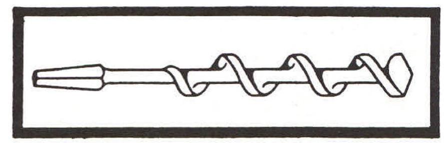
fits the tapered end of the axle. The hub is screwed to the workbench.

Tools such as a bench plate, a V block, a bent riveting anvil and the like, each fitted with a rear axle shank, can be placed readily and quickly in the socket and revolved into the most convenient position. As the threaded end of each tool shank projects through the bore of the hub, an upward tap with a hammer will knock it out.

The castings for the bench plate and the V block are bored for a press fit over the turned end of the axle.

AN AUGER BIT FOR BORING END GRAIN

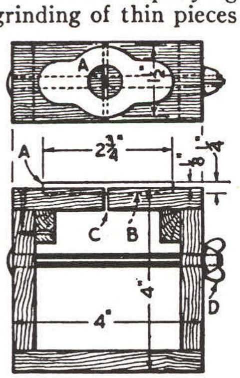
Boring end grain with an ordinary auger bit is much harder than boring in flat grain. When a bit has the spurs worn down until it no longer works well it can be fitted for boring end grain so that it will bore as fast



or faster than a new bit on flat grain. The screw is cut off and the spurs are ground completely away as in the illustration. The cutters are then ground so that the center of the bit projects slightly ahead of the outer end of the cutters to give it a point. The cutters are then filed as on an ordinary auger and the bit is ready to use. A bit of this kind will bore end grain of hard wood much faster than a regular auger and it will do the job much easier.

Fixture for Holding Thin Work to be Ground

DIFFICULTY is often experienced in disk-grinding thin pieces like the flange shown at *A* in the accompanying illustration. The grinding of thin pieces is considered an unpleasant operation, as it brings the fingers close to the grinding wheel. However this trouble can be remedied in most cases by using a work-holding fixture.



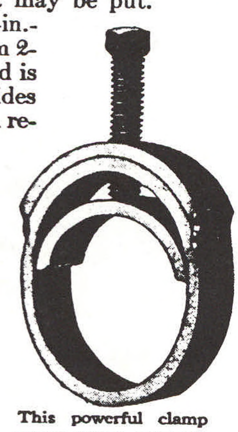
How the wooden grinding fixture for thin parts is made.

The fixture shown for holding part *A* is simply a wooden frame with a recess cut at *B* about $\frac{1}{8}$ in. deep and of the same shape as the flange to be ground. The upper member of the fixture is cut in two at *C*, thus forming two jaws which can be clamped on the work by tightening nut *D*.—LEONARD KEISER, JR.

General Utility Shop Clamps Made Quickly by Welding

THE new style of clamp illustrated is welded from pieces of scrap boiler tubing. It is strong enough to stand any strains to which it may be put.

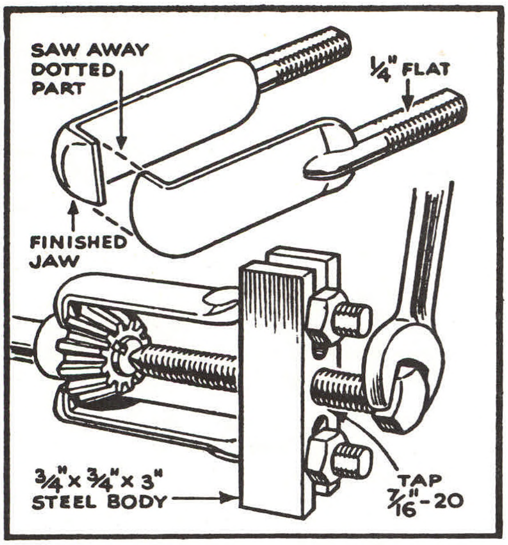
In making it, a 1-in.-wide ring is cut from 2-in. boiler tubing and is flattened on the sides to an oval shape. A reinforcement made from a section of a similar ring is fitted snugly around one end of the oval, and the ends of this are oxyacetylene welded to the sides of the oval-shaped section.



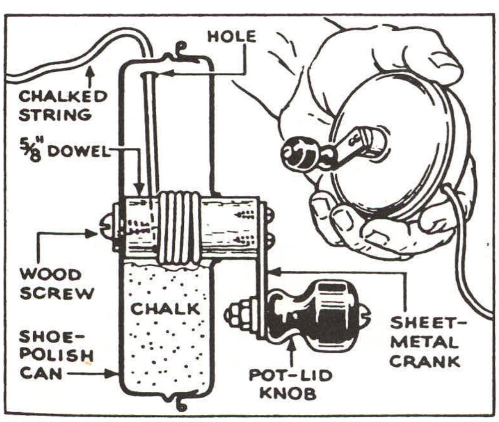
This powerful clamp serves many purposes

A $\frac{5}{16}$-in. hole is drilled through the top of this reinforced section and top of ring, then tapped for a set screw.

The shoe of the clamp is another piece of 1-in.-wide ring cut from boiler tubing, bent to fit, if necessary. A spot is countersunk in the top of the shoe to receive the point of the setscrew.—A. G. WIKOFF.



Puller from Spring Clip. First sawed and then ground to final shape from an automobile spring clip, this little puller is convenient for removing gears, ball races, collars, and pulleys. The flats on the threaded ends not only prevent rotation in the slots of the bar but also make the puller adjustable for size, which is a useful feature. The cap screw is about 2¼" long, is threaded full length, and has a 60-deg. rounded point. Parts subject to wear such as the screw point and sidepiece jaws should be case-hardened.



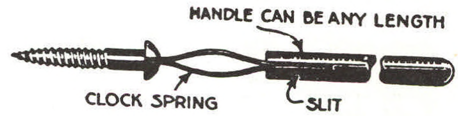
Polish Can Holds Chalk Line

AN EFFICIENT carpenter's chalking line may be made from a shoe-polish can. Drill the holes in the top and base of the can for the dowel and the wood screw. Cut a piece of sheet metal for the crank and use a pot-lid knob for a handle. Fasten an end of the string to the dowel with a small tack. Half fill the can with powdered chalk. The line is rechalked each time it is rewound.—*Roland Cueva, Manhattan, N. Y.*

Here's an Ingenious Screw-Holder for Starting Screws

IT is sometimes necessary to start screws in a place that cannot be reached with the fingers. When such a condition is met with, the tool shown in the illustration will prove very handy.

A piece of ¼-in. rod is used for the handle and slotted for a distance of about 1 in. at one end by sawing. An old alarm-clock



How to start screws in otherwise inaccessible places

spring furnishes the material for the fingers of the holder. A piece of this is doubled in the middle and forced into the slot in the handle. The fingers are shaped as shown and the ends squared by filing.

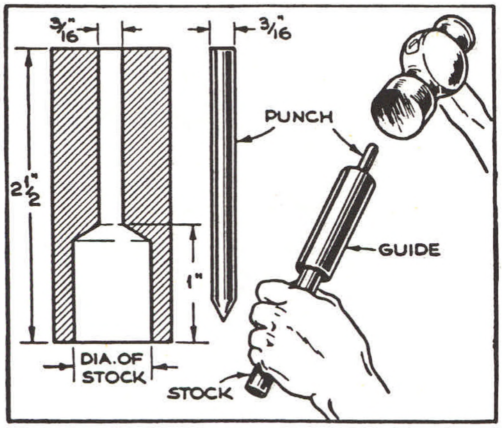
To use the holder the fingers are pressed together and slipped into the slot in the screw. After the screw is started, the holder is pulled away from the screw.

Old Fence Posts Lifted with Lever and Chain

MANY devices are used for lifting fence posts, but for ordinary use the homemade one illustrated above will serve surprisingly well. Heavy, hard-to-pull posts can be raised with it. Obtain a stout piece of hardwood and a heavy iron bar. In one end of the block of wood cut a slot for the bar. Drill through both members for a heavy bolt and assemble as shown. Bolt a short piece of chain with a hook at one end to the short end of the lever. To operate, hook the chain around the post loosely and pry. As the post comes out, let the chain slacken and slide down the post. Then pry again.—NORVAL WRIGHT.

Guide Finds Center of Round Stock

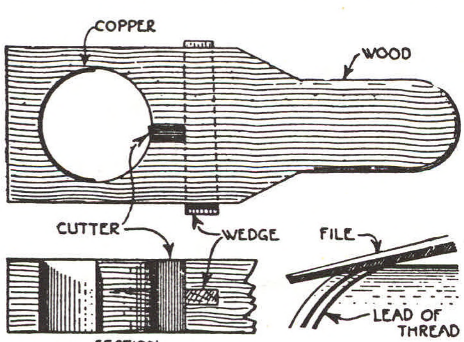
SEVERAL guides made out of steel as indicated in the accompanying diagram enable me to locate the center of wood or metal round stock with ease. The interior diameters vary to fit different sizes of stock. If preferred, one large guide could be made and bushings used.—R. E. BELLINGER.



Emergency Thread-Cutting on a Large Pipe

A THREAD-CUTTING tool as shown can be made from any available block of wood and faced with a sheet of brass or copper at the opposite side from the cutter. The thread-cutter can be borrowed from a die with detachable blades of lesser diameter if the lead is right, otherwise a part of a flat file or small piece of tool steel can be tooth-cut with a triangular file and tempered.

When set in the block, it is backed up with a wedge or tapered file for setting it out as the thread is turned. It is advisable to start the thread with a triangular file making two cuts around the part to definitely mark the lead of the thread. When this is done, the thread can be rapidly turned and the size made to conform to the surrounding part, with the adjusting wedge provided. Similarly, threads that are turned oversize and will not enter can be readily made to size with this method.—G. A. LUERS.



With this improvised tool, made of a block of wood and a steel cutter, threads may be cut in large pipes

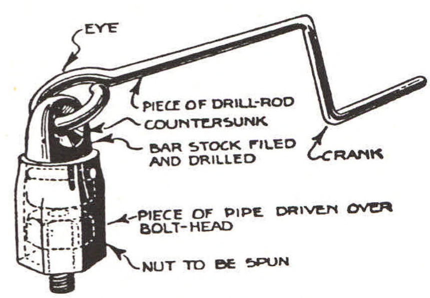
Shopmade Speed Wrench of Simple Construction

A SIMPLE form of jointed speed wrench for a small shop is worth duplicating, being of especial advantage in getting around almost any form of interference due to pumps, wires, and pipes. This wrench is not used to start or finish the bolt turning, but is for the express purpose of spinning them off.

A heavy open-end wrench is used to start the bolt and this speed wrench is slipped on, when a quick job of removal is made. To make the wrench, use a 1- or 1½-in. length of pipe. Drive this over the bolt head and flatten up the sides to a fair fit.

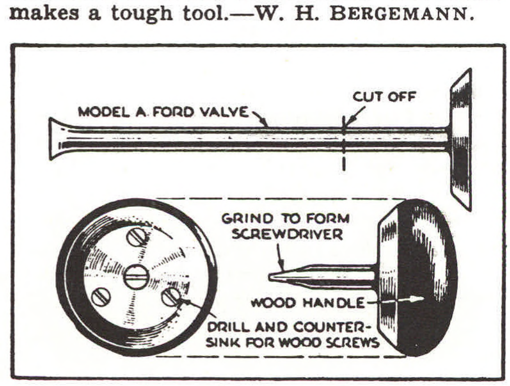
Use a piece of round stock and after drilling through one end, countersink from each side and round the end over as shown. Rivet this into the socket. Make the handle as shown, with a crank end and an eye to engage the eye made in the socket plug.

To use, hold the handle in the left hand and turn the crank with the right. This wrench is particularly useful for removing cylinder-head bolts, especially those of a V-type eight- or twelve-cylinder motor.

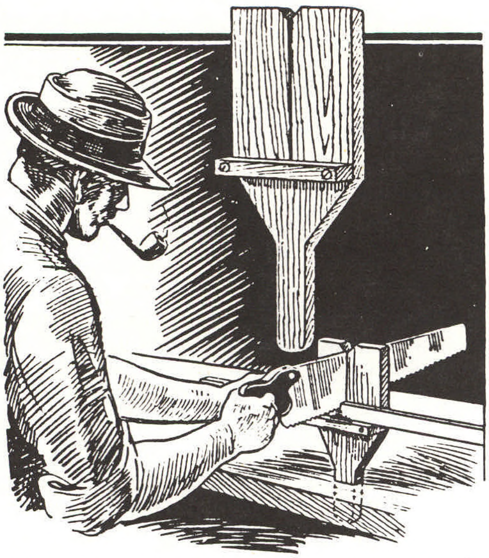


Here is shown a simple form of a homemade speed wrench which will be found very useful

CLOSE-QUARTERS SCREWDRIVERS may be made easily from the head and part of the stem of discarded auto valves. Cut off the stem of a valve at the desired length and grind the end of the part left on the head to form the screwdriver blade; then drill the head for three wood screws with which a handle can be attached. The metal makes a tough tool.—W. H. BERGEMANN.



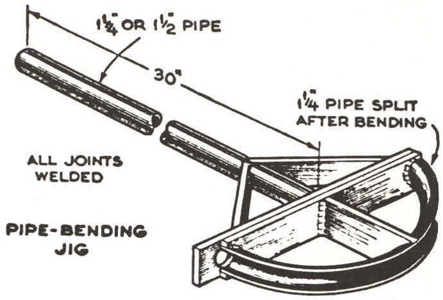
Simple Tool Aids in Sawing Lath Strips



Much Time Is Saved in Squaring and Sawing Lath by Using This Tool

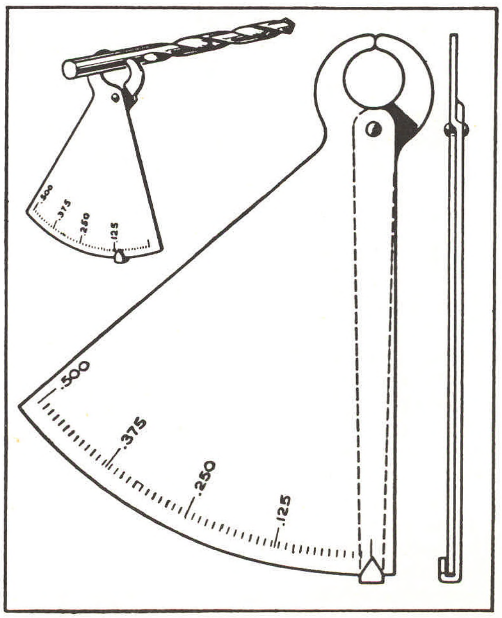
To save time in squaring and marking small lath strips for sawing, one worker used the squaring tool, which was made from a scrap piece of 1 by 6-in. stock. In use it is set in a slot cut in the workbench top. A vertical slot in the tool guides a saw, while a cleat screwed to the block supports the work.

Jig for Bending Pipe



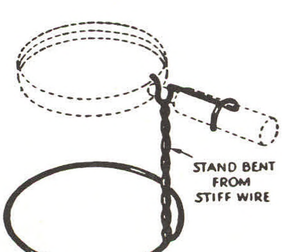
ONE 30" length of 1¼" pipe forms the lever of this jig. The bending head is a piece of similar pipe bent to a semicircle 12½" in diameter. This is then split all along the curve (preferably with an oxyacetylene cutting torch) and the rough edges filed or ground clean. A piece of ¼" thick iron with a 1⅜" hole at one end is welded across, the handle welded to this, and reinforcing braces added as shown. The device will handle any pipe up to 1".

QUICK MEASURING of drill, bolt, and screw diameters is possible with a gauge made and used as shown below. Both sections are cut from a scrap of sheet metal. Part of one forms the sector of a circle with a radius to the riveted joint; the other tapers to a point that is bent over to serve as a pointer on a calibrated scale. Close the caliper legs and mark the zero exactly at the pointer. Calibration may then be done with gauge blocks or a set of drills of known sizes, and the scale marked in thousandths or in drill sizes.—IRVING ZEICHNER.



Simple Wire Stand Supports Magnifier for Drafting

FOR very finely detailed drafting or bench work on minute parts, a large magnifying glass may be supported by means of a wire frame made as shown below. It holds the glass at the proper distance to keep it in focus, thus leaving both hands free for working. The stand is constructed from a piece of stiff wire. The size of the base loop depends on the magnifying glass used, but it should be about ½" larger in diameter than the glass. The height of the supporting stem is determined by looking through the glass and moving it up and down till the most satisfactory magnification is obtained.

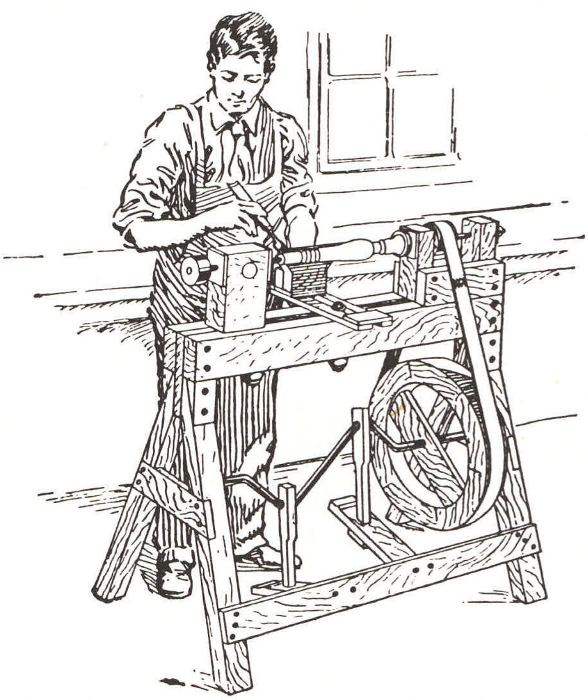


A Craftsman's Combination Foot-Lathe

An inexpensive combination scroll-saw and wood-lathe

By C. H. Patterson

SIMPLICITY and economy have been kept in view in designing this combination lathe. It will swing 6 in. above the bed and 4 ½ in. above the tool-rest support, and it is about 18 in. between centers. The swing can be made greater by increasing the height of the head and tail stock-standards, and the length of the bed can be increased to 4 ft., if a third bend is made in the crank as shown in the center line drawing. In this case, it will be necessarv to use a crank of larger diameter, say, 1¼ in. The bed of the lathe is made of two hardwood timbers 36 in. long, 4 in. wide and 2 in. thick, separated, as shown in the end elevation, by 1 by 3-in. pieces, to which they are bolted. The left piece forms a part of the outer standard, as shown in the detail drawing of that standard. The legs are of stock 3 in. wide and 2 in. thick. A triangular piece is sawed from an upper corner of each leg. These pieces are nailed to the outer surface of the legs, care being taken to place them so that they will not be in the way of the holes bored for the bolts. These holes are then bored and the legs bolted to the 1 by 3-in pieces mentioned. It will be seen that the triangular blocks provide parallel surfaces for the heads and nuts of the bolts that pass through the legs.



The lathe as it is used for turning wood. Attachments may be applied for other kinds of work

The crank is of 1-in. iron, bent as indicated in the center drawing. This will be a job for the blacksmith and machinist, but the cost of the completed crank should be small. For a distance of 1 in. inward from the ends of the crank, it is turned to a diameter of ¾ in., to provide bearing surfaces. Pieces of ½ by 3-in. stock are screwed across the outer sides of the legs. To the inner surface of these pieces are nailed other pieces of 1-in. stock, in which holes should be bored to receive the bearing-ends of the crank.

A strip of 1 by 4-in. material is nailed across the back of the legs and to it are screwed the hinges upon which the pedals swing. The pitmen may be cut from a 1-in. board. Holes are bored in them to receive the cranks. A central slot is made with a saw-cut in the ends of the pitmen for about half their length, and the parts are pried open and slipped on the cranks. Some pieces, 1 by 3 by 4 in. are nailed to the lower side of the pedals and nails are passed through them and through the pitmen. Half round strips are nailed across the pedals near their free ends for the feet to rest upon.

The drive wheel is built up of three series of segments cut from 1-in. board, preferably of hardwood. The single spoke in this wheel is also built up of three pieces. The central piece of the three must extend well into the wheel-segments. These segments can be sawed with a band-saw. The hole in the spoke that receives the crank-shaft should be bored true in a boring machine. A smaller hole is bored through the spoke to receive a pin, for pinning the wheel to the shaft. After the wheel is mounted, a board may be clamped across the legs, close to the wheel, for a

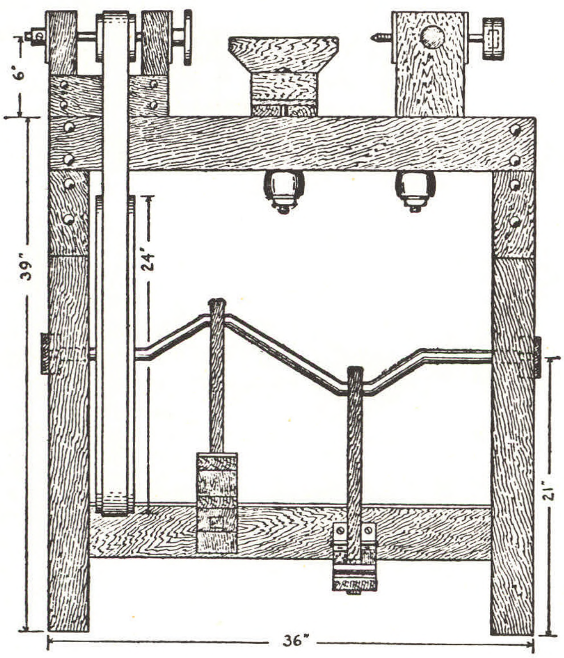
rest in using a turning gauge, for truing the wheel.

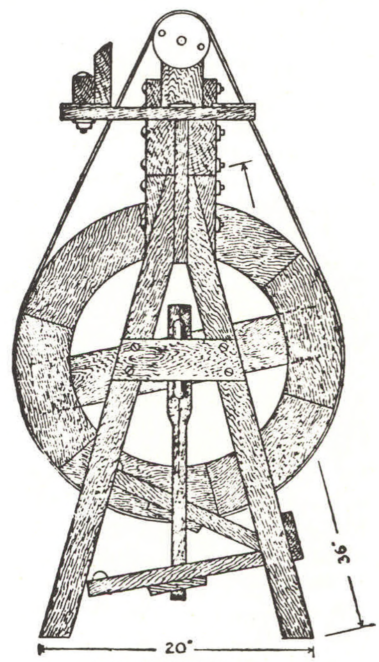
The outer standard of the head stock is made of stock 3 in. square, and the inner standard of 2 by 3-in. wood. Holes 1¼ in. in diameter are bored through these standards at the proper height for mounting the spindle, which may be of ⅝-in. shafting and about 12 in. long. Holes ½ in. in diameter are bored vertically from the top of the standards to meet the 1¼-in. horizontal holes. These holes receive the babbit metal which forms the bearings for the spindle. Four pieces about 3 in. square are cut from a rather thin board, and ⅝-in. holes are bored through their centers.

It is best to bore the holes before cutting out the blocks. These blocks are clamped or lightly nailed to the faces of the standards so as to support the spindle in its true central position and in line with the bed of the lathe. The parts of the spindle that lie within the standards should be wrapped with a single thickness of paper, which may be pasted to the spindle. Putty should be used to close all cracks so that the melted babbit-metal cannot escape. Old type metal may be melted in an old baking powder tin can, over an ordinary gas or gasoline burner, and used for this babbit-metal. The can must be without soldered seams or joints. A sharp V-shaped lip should be formed in the rim of the can for pouring the metal. A handle for the can may be quickly made by twisting a wire around it. It is well to heat the spindle before pouring the metal, otherwise the metal may be chilled and the casting spoiled.

The spindle may be heated by tilting the lathe sidewise and placing a small oil-stove or a large lamp below it. Having heated the spindle, place the lathe in an upright position and pour the melted babbit-metal in the vertical holes, filling them well to their tops. When the metal has set, remove the retaining blocks and remove the spindle from the bearings and then take off the bits of wrapping paper. Drill ⅛-in. holes down through the vertical extensions of babbit-metal to form oil-holes. The standards may be strengthened by bolting pieces of 1 by 3-in. material across their sides, above the bed.

If the craftsman has access to a foundry, a pattern may be made and a casting obtained for the face-plate which may be drilled to fit the spindle, to which it is secured by a pin. Another method of attaching the face-plate is to cut a screw





Side and end elevation views of the lathe without its attachments, giving general dimensions for the larger pieces in its construction and showing the location of the parts

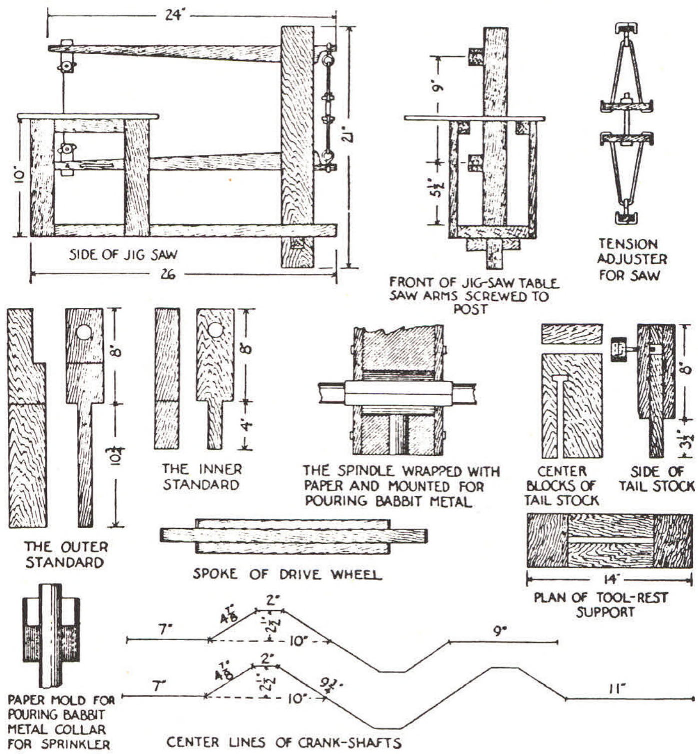
thread on the spindle and to drill and thread a corresponding hole in the face plate.

Another method of making a face-plate is to thread the spindle to receive a large nut, to which a metal disk about ¼ in. thick and 4 in. in diameter has been fastened with small machine-screws. It is well to have the surface of the face-plate turned true in a machine-lathe. Holes for 1 by 3/16-in. stove or machine bolts are drilled and threaded in the face-plate. A babbit metal collar for the outer end of the spindle may be cast by building up a paper mold around the spindle as indicated in the drawing. The spindle should first be wrapped with a single thickness of paper as for casting the bearings.

Another way to make a collar is to thread the end of the spindle to receive a large nut. The rounded face of the nut should be placed next to the standard and the thread cut the proper distance down the spindle so that the nut shall bind upon the end of the thread, before it binds upon the standard. Metal plates 3 in. long, 2 in. wide and ⅛ in. thick are screwed to the outer faces of the standards to receive the end-thrust of the spindle. The pulley is about 3¾ in. in diameter and is secured to the spindle by a pin. The faces of the pulley and drive-wheel should be turned slightly convex. The support for the tool-rest is made of two wood pieces each 14 in. long, 2 in. wide and 1 in. thick, fastened together by means of cross strips, leaving a ½ in. slot between the pieces to receive the center bolt. Hand wheels 2 in. thick and 3 in. in diameter are used for tightening the nuts on the bolts of the tool-rest and tail-stock. The wheels may be turned from wood.

The tail-stock is built up of three blocks cut from 1-in. board. A slot to receive the square head-locking bolt is cut in the center block. The center block may be bored to receive the tail-spindle or it may be made of two sections as shown. The tail-spindle is a ⅜-in. square head-bolt about 10 in. long. The hand wheel for the tail-spindle is made of two ¾ by 3-in. wood wheels nailed together. One of these is bored to receive the bolt, and square recesses are cut into the inner faces of the wheels to receive the head of the bolt. Screwed to the tail-stock are two iron pieces, each 3 in. long, 1 in. wide and ¼ in. thick. One of these is drilled and threaded to receive the threaded end of the bolt, and the other piece is drilled the full diameter of the bolt. A hand-wheel, bolt and nut are used for locking the tail-spindle. The head of this bolt is recessed into the hand-wheel in the manner described for the spindle-bolt. It may be necessary to cut the thread of the tail-bolt somewhat longer than the thread found upon it. The end of the bolt is filed to a conical point.

A spur center is made by screwing a 3 or 4-in. wood wheel to the face-plate, passing the screws through the wood into the holes in the face-plate. The heads of the screws must be countersunk into the wood. Reverse the position of the tool-rest, turn the lathe and mark the exact center of the wheel. Drive a nail for a center spur, file it and break off surplus



Details of the parts for making the jig-saw and tool-rest attachment and curves for crank-shaft of two lathes

length and sharpen the spur. Drive two smaller nails for drive-spurs and sharpen them in like manner. The distance from the center of the driving-spurs may be varied to suit the work in hand. A screw-center may be made by passing a wood screw outward from the center of another wooden face-plate wheel. A simple strip of wood may be used in place of the wheels.

Drilling may be done in the lathe by using square shank, bit-stock twist drills. Screw a wood wheel to the face-plate, find its center and cut a square tapering hole to receive the shank of the drill. Remove the tool-rest and in its place set a small but strongly made box about 10 in. high and 5 in. wide. On the lower side of the box, nail a strip of wood 1 in. square. This strip slides in the channel in the lathe-bed and keeps the box from turning around. Move the tail-stock up to position and use the tail-screw for advancing the work against the drill. The material to be drilled rests against the left side of the box, and the screw bears against the right side. If round material is to be drilled, gouge out a semicircular channel in a wooden block, place it against the side of the box, and let the material lie in the channel.

The jig-saw is supported by a baseboard 26 in. long, 6 in. wide and 1 in. thick, which is bolted to the bed by using the bolt from the tool-rest. The baseboard is slotted to receive the bolt. The standard which supports the saw-arms is fastened to the baseboard by a tenon and wedge, as shown. The standard may be of 2 by 3-in. stock. Added strength may be given to the standard by attaching a common shelf-bracket. Cross strips are nailed to the saw-table and to these strips and the baseboard are nailed four supporting strips. The ends of the saw-arms are slotted to receive two pieces of flat iron each 2½ in. long, ¾ in. wide and 18 in. thick. These are drilled to receive the pins which pass through the arms, and the wing-bolts used for clamping the saw. The construction of the tightener for the saw is plainly indicated in the drawing.

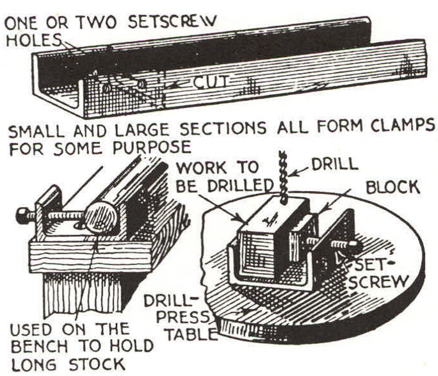
The saw is driven by means of a ¼ by 3-in. bolt inserted about 1¼ in. from the center of a hardwood face-plate wheel, attached in place of the spur center. The head of the bolt should be countersunk into the wood and should be placed next to the face-plate, so that the bolt cannot by any chance come out while the saw is in use.

A SIMPLE RIVETING-TOOL

For repairing belts and the like with copper rivets this tool will be found very handy. Drill a ¼-in. hole through a heavy machine bolt about 3 in. long, and insert a steel punch that fits the hole nicely, having the punch a little longer than the bolt. Center this tool on the rivet, tap the bolt lightly to drive the washer down, hit the punch a sharp blow, and the job is done. It saves your thumb-nails.—Contributed by Will Parker, Olaf, Iowa.

Clamps Quickly Made from Short Lengths of Channel Steel

IN EVERY shop large clamps, small clamps, wide clamps, and all kinds of clamps are constantly in demand. Good serviceable ones may be made from ends of structural channels. These are cut up in convenient lengths and tapped for one or two setscrews, as shown. The screw is then used to clamp the work against the



Waste channels serve for cutting clamps of various sizes

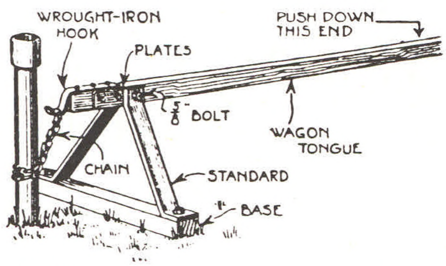
opposite flange of the channel, and for fine work a block can be interposed between the work and the point of the screw.

For holding work on the drill-press table, for securing parts together while riveting, for holding long stock while sawing, and for hundreds of other purposes, these clamps will be useful. Whenever a length of channel is available, it is well to seize the opportunity to make one or more.—M.B.K.

Pipe-Pulling Tool Is Useful on the Farm

TO pull a pipe from the depths of the earth is strenuous work, but here is a tool that will be a sure help.

Get a wagon-tongue and cut it about 8 ft. long. At the large end or butt, screw two steel plates to opposite sides and drill three holes through the plates and timber 6, 9, and 12 in. from the end. Holes should be ⅝ in. in diameter. Then have a blacksmith forge a large hook with a flat shank



Pulling pipes from the ground is difficult without the aid of a device similar to the one shown

and bolt this to the top of the tongue so that the hook lays over the end and down.

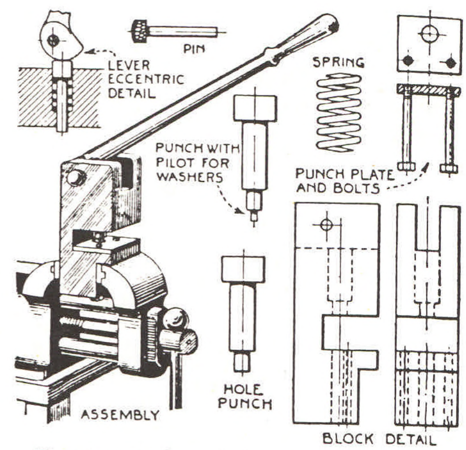
The standard is composed of three pieces of *heavy* strap iron bolted together in the shape indicated, with a ⅝-in. hole drilled in the top of each bearing to correspond with the holes in the tongue. Then the tongue is pivoted to any one of the three holes by a ½-in. bolt as a pivot bearing.

Set this lever so that the hook comes 2 or 3 in. from the pipe and wind a strong chain about the pipe a foot or so below the hook. Pull the turns of the chain tight, so that they bite the iron and hook a link at each end over the hook. This raises the far end of the tongue. Then, by exerting the weight of the body on the end of the lever, with the chain biting good, the pipe will come.—L. B. ROBBINS.

Hand Punch for Small Work Is Held in Vise

TIME and labor can often be saved in the shop if a small hand punch for the bench vise is available to handle work that cannot be done economically on a power punch.

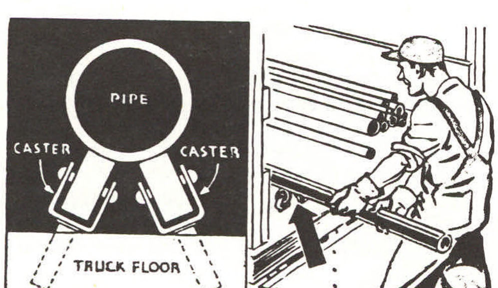
The base of this small punch is clamped in the jaws of the vise and the lever pulled down by hand. Punches and corresponding punch plates are made to suit the work and can be changed readily. Two screws engaging tapped holes keep the punch plates



The vise punch ready for use and its parts

in place, and by removing the lever pin one punch can be substituted for another. When punches of large diameter are used for making up small washers, a removable pilot is screwed into the center of the punch, as indicated. Pilots of various sizes can be used with any one punch.

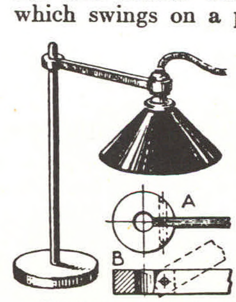
The base block and lever are forged steel and the cam end is hardened to resist wear. The lever is held by a removable pin, and a single heavy spring retracts the punch. All the punch bodies are the same diameter for interchangeability.—L. A.



NONSWIVELING CASTERS, mounted in the floor of a truck or other place where pipes are loaded, will enable one man to handle long sections with little trouble. Bore two holes in the floor, as shown above, having them at an angle so the casters lean toward each other.—R. E.

Adjustable Lamp Bracket

THIS lamp bracket can be adjusted instantly with one hand. The standard is merely a round rod set in a heavy base. A free fitting collar slides on the rod and carries the extension bracket, which swings on a pin as shown at *A*. The inner end of the bracket is filed eccentrically, as at *B*, to serve as an automatic clamp. Lifting the lamp a trifle releases the friction catch and frees the collar so that the bracket may be moved up or down, or turned. —R. H. KASPER.



The bracket is locked by a simple eccentric

MAKING AN S WRENCH

The following directions, together with the accompanying illustrations, showing a simple way to make an S wrench, are from a correspondent of the Blacksmith and Wheelwright:

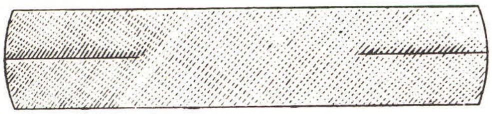


FIG. 1

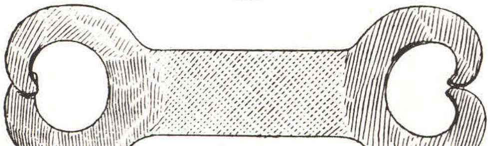


FIG. 2

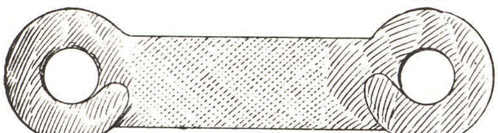


FIG. 3

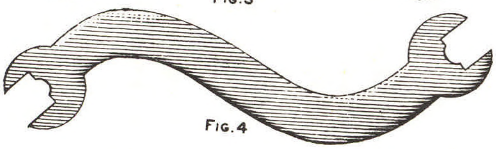


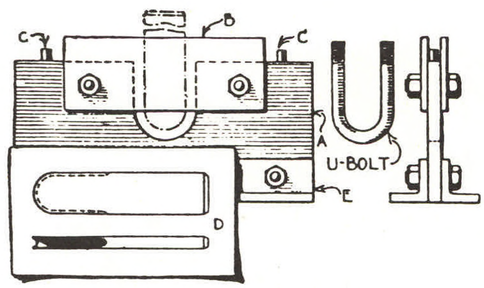
FIG. 4

Take a rasp or file and split the end about 3 in. for a wrench to take nuts of from ½ to 1/16 in., as in Fig. 1. Square up the edges, point the ends, and turn each to a ring, letting them lap each other as in Fig. 2. Weld down and cut out the end and dress up, and you have a stout wrench. Weld the ends solid except a hole in the center as in Fig. 3. Cut out at the ends and fit to the nut as the size desired. Fig. 4 shows the complete wrench. They are the best wrenches I have ever made. One 16-in. rasp will draw out to a good length for a large wrench.

Bending U-Bolts with a Homemade Tool

THE illustration shows a tool that was constructed to bend U-bolts which were threaded at both ends and taken hot from the fire.

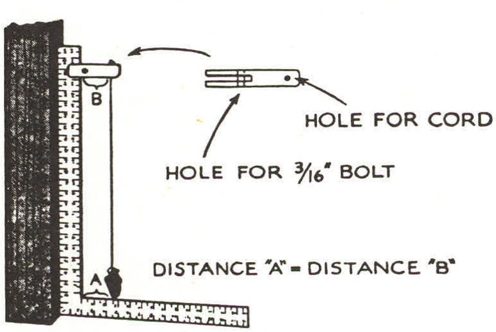
The body, *A*, is made from a piece of flat bar steel, a little wider than the U-bolt and was cut out on the top side the desired shape of the formed bolt. Two plates, *B*, bolted to the



If you have U-bolts to bend, here is the tool to do it quickly and neatly

sides, and with the pins, *C*, held the red-hot rod in position, while with the forming bar, *D*, it was forced into the U shape with a few strokes of a hammer. The forming bar was grooved to fit the bolt.

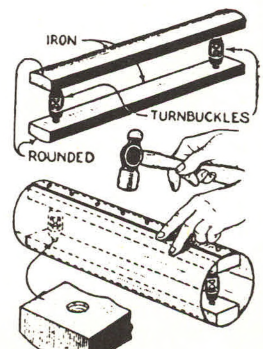
The two angles, *E*, were bolted at the under side of the flat steel bar, as shown, to hold it in an upright position. With this form the two hundred bolts were bent true and all alike in a very short time.—E. S. GOODELL.



For an accurate emergency level, attach a wooden block to the blade of a framing square and swing a plumb bob from it. When level, A will equal B. Either horizontal or vertical work can be checked

Adjustable Anvil for Riveting Seams of Sheet-Metal Pipe

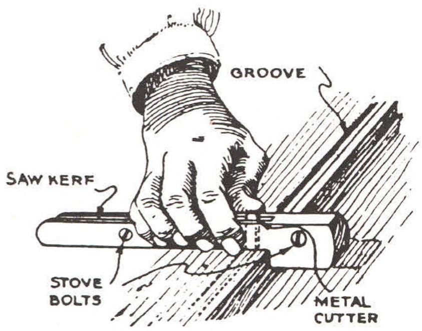
When various sizes of galvanized-iron pipe must be made on a job away from the shop, sheet-metal workers will find this adjustable anvil helpful in riveting the seams. The anvil consists of two 1-in. iron bars 2 in. wide and a couple of strong, stub-end turnbuckles. The bars are rounded on one side and then drilled near the ends to take the ends of the turnbuckles, which are threaded.

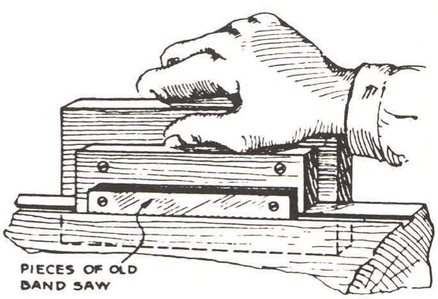


TWO TOOLS THAT MAKE INLAYING EASIER

THE two homemade tools illustrated below are extremely useful for inlaying furniture and other woodwork.

In making the first tool shown, any hardwood such as walnut, oak, or maple will do. A piece ¾ by ¾ in. and 6 in. long is shaped as pictured, and a saw kerf is made to receive the cutter, which may be filed from a scrap of steel. A steel cut nail or a horseshoe nail will serve for making the cutter, and an occasional stroke with a file across the cutting end will keep it sharp. By shaping the cutter, the tool can be used equally well as a slitting





Since each tool has advantages for certain kinds of inlaying, it pays to make both.

gage or a fluting tool. The cutter is held in place with three or four stove bolts.

The second tool is made from two small blocks of wood and pieces of hack saw or band saw blades. The smaller block determines the distance the inlay will be from the edge of the piece being inlaid, so it is desirable to prepare a number of these blocks of varying thickness. Likewise, the width of the groove depends upon the thickness and number of the pieces of saw blades used, and therefore a supply of these should be kept on hand.

The groove in the work should be slightly less in depth than the thickness of the inlay. When the groove is ready, the inlay should be given a thin, even coat of glue and pressed into place. Cover it with strips of paper and clamp it with the aid of wood strips to insure an even pressure.

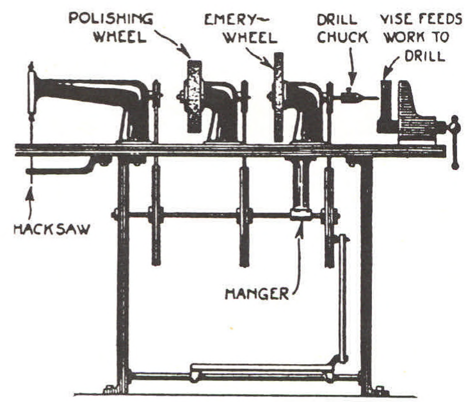
Where stain is to be used, the inlay should be shellacked with a small brush to make it impervious to the stain, as it is essential to preserve the natural colors of the inlay. If a band saw or a variety saw is available, very creditable inlays can be made by gluing together thin strips of different woods and, after the glue hardens, again sawing the block at right angles to the glued faces. However, inlays cost so little that few craftsmen attempt to make their own.—A. E. GRAY.

Building a Foot-Power Machine for Light Work

OLD sewing-machines, which usually may be obtained at small cost from junk dealers, will make a useful small combination footpower machine for the home workshop or for a repair-shop. At a cost of less than $5, the writer has just completed one that is a miniature machine-shop in itself—a hacksaw, jigsaw, emery-grinder, polishing-wheel, drill-chuck, and vise.

Obtain one sewing-machine frame with foot pedal and driving-wheel complete and three or more old machine heads. Mount a heavy plank top on the frame and fit up the machines as shown in the illustration.

The first will operate a hacksaw or fretsaw blade, clamped to the needle-shaft



A machine-shop in miniature

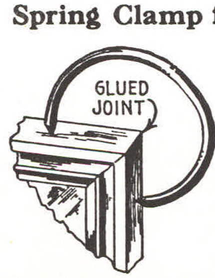
after the presser-foot has been removed. The blade passes through a slot in the table and is attached to a spring underneath.

The second head is sawn off near the pedestal, as shown, the shaft shortened and a bearing made of Babbitt-metal. The wheel is wood, covered with fine emery-cloth.

The third head is mounted in the same way and drives an emery-wheel. Into the other end of the spindle a drill-chuck is screwed. The work is held against the drill and fed to it by means of an ordinary bench vise. The end of the slide bar of the movable jaw will serve to press the work against the drill if the vise is mounted at the right height; and the vise itself will still serve for light work, or even for heavy work, if substantial bench legs are placed beneath it.

In remodeling the frame below, a hanger was provided for the long drive-shaft and the crank wheel turned around so that the driving crank is outside.—R. E. LEIBE.

Spring Clamp for Glued Joints



SINGLE turns of spring wire cut from an ordinary bedspring make fine clamps for holding together small glued joints, such as at the corners of picture-frames. One complete coil of the desired diameter is cut from the spring and sharpened at both ends.—M. E. S.

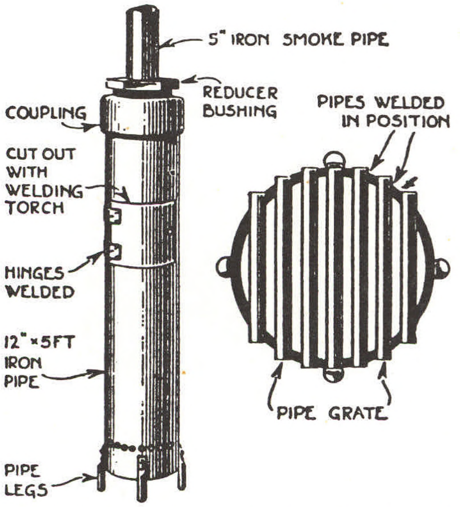
An Efficient Shop Stove of Pipe and Fitting

THIS space-saving stove will give enough heat to warm a fairly large shop, and the only tools needed are such as are found around any machine-shop.

Most of the work is done with the welding-torch and a drill. The materials necessary are one piece of 12 in. or 14 in. iron pipe 5 ft. long; one coupling to fit; one reducing bushing to reduce to 5 in.; enough 5-in. iron pipe to reach beyond the roof; 2 ft. of 1-in. pipe for legs, small pipe for grates, and a pair of 3-in. butt-hinges.

The legs are 6 in. long and are flattened at one end and welded in place. The door is cut with the torch, and the hinges welded in place. After the holes are drilled for the grate-bars, the bars are also welded to keep them from slipping out.

When the stove is in operation, the top becomes red hot and gives out plenty of heat. The combustion of the fuel is so nearly perfect that very little smoke comes from the chimney.—CHARLES N. SHAW, JR.



This stove occupies a very small space, but will supply a considerable amount of heat

Cheaply Made Bench Machine Threads Small Work Rapidly

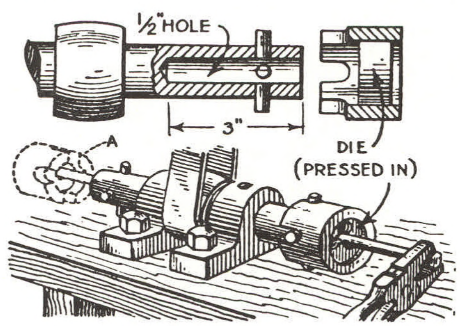
A SIMPLE threading machine that saves time in cutting threads on small work is illustrated. With it many odd jobs of threading can be done more conveniently and quickly than by putting them in the lathe.

Two pillow-block bearings are bolted to the bench to take a shaft, which is fitted with a pulley and drilled at each end for four pins. These pins engage the four projections on a die-holder made of pipe. The speed should be about 250 revolutions a minute.

To thread bolts or rods, the bolt is gripped in a pair of pliers and the end pressed into the die as shown. When the desired length has been threaded, the rod or bolt is drawn from the shaft, taking with it the die-holder. This, of course, stops the die-holder from rotating. The shaft never stops.

To run the die off the bolt, it is placed on the left-hand end of the shaft, as shown at *A*, the rod or bolt being held with the pliers as before.

With a little practice threads may be cut rapidly and accurately.



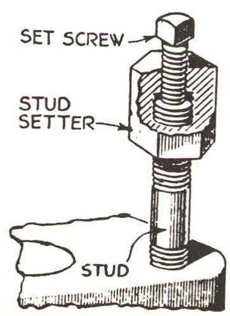
One end of the shaft runs the threading die on; the other turns it off

Setscrew Type of Stud Setter

IN SHOPS where a great many studs are set, as in assembling pumps, the stud setter illustrated is well worth making.

It consists of a short length of hexagonal steei drilled and tapped at one end to fit the stud and at the other to take a setscrew.

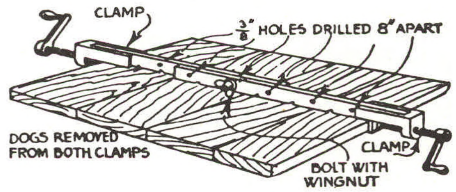
The device is screwed on to the end of the stud loosely and the setscrew is tightened down. A wrench then may be applied and the setter turned into place. When the setscrew is loosened, the stud setter may be removed easily.—



Stud setter designed for easy removal

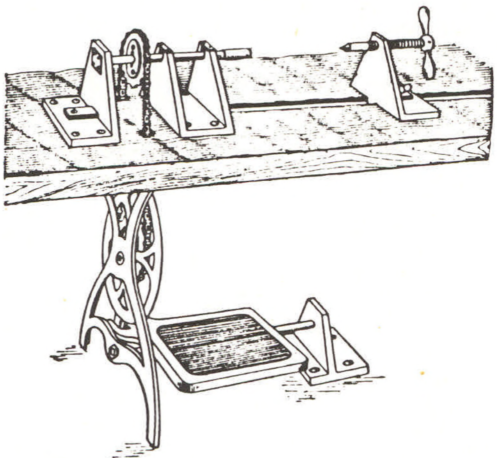
Making Long Woodworking Clamps from Short Ones

WHEN a long woodworking clamp is necessary, it often is possible to join together shorter clamps in pairs. This expedient first suggested itself when some tables about 6 ft. long had to be glued up and the only available clamps were about 4 ft. long. The writer had ⅜-in. holes drilled through the bars and then fastened pairs of clamps together with machine bolts and wingnuts.—FRANK P. WENTZEL.



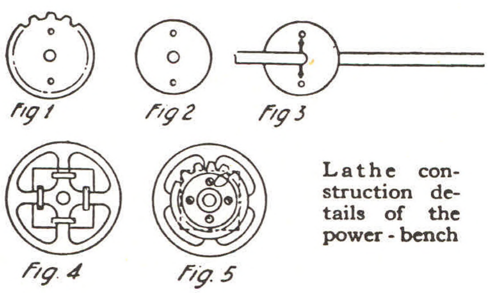
Making a Handy Power-Bench

EVERY workshop should include a power-machine like the one shown in the illustration. It can be used as a wood-turning lathe, for running an emery-wheel, and, in fact, for many other



This arrangement of a power-bench can be made on an old sewing-machine body

necessary operations. Procure a chain and two bicycle sprocket wheels, a steel rod, ranging from ¼ in. to ½ in. in diameter and 1 ft. long, one side of a sewing-machine stand, with the wheel and



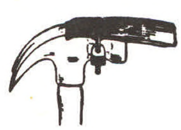
Lathe construction details of the power-bench

treadle, a piece of galvanized sheet iron, 1 ft. sq., but not too thick, a thumb-bolt, and a clamp from an old emery-wheel.

Screw four supports to the top of the bench, as shown in the illustration. The one to the extreme left has a hole drilled near the top and a short piece of tubing fitted into it to receive the shaft. Screw a piece of iron on the back to act as a stop for the shaft. Make grooves in the tops of the two middle supports and, after inserting tubing, screw galvanized strips over the tops to secure the shaft. Drill a hole in the support represented at the right. Make it a size smaller than the thumb-bolt, which should be filed to a point, and insert the bolt. In placing these supports and drilling the holes, care must be taken to keep the shaft perfectly level and in a straight line with the thumb-bolt.

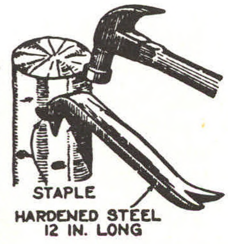
Make a slit in the bench exactly parallel with the line of the shaft. Drill a hole in the base of the right support and insert a bolt to pass down through the slit. Make two holes in the bench at the proper place to let the chains run through, and drill a hole in the shaft directly above. Place the part shown in Fig. 1 on that shown in Fig. 2, and both on the part shown in Fig. 3. Bolt them together, place them on the shaft, pass a nail or wire through the shaft, and solder it to them. At the end of the shaft a number of different forms of chucks may be used.

Fasten a small board to the sewing-machine wheel by means of strips as shown in Fig. 4. Then attach the gear, Fig. 5. A stick connecting the treadle with the wheel and a support for the treadle must also be adjusted before the machine is complete. When finished, anyone may be proud of this little power-machine.—HARRY B. DURLIN.



Puller for Fence Staples

HERE is another tool for pulling obstinate staples when fencing. It gets them all; indeed, it is better than an expensive pair of fencing pliers that I have. I made the puller from ¾ in. square steel and hardened it.—H. H.



How the tool is used to withdraw staples.

Improvised Pipe Wrench

OCCASIONALLY a pipe wrench is needed badly on a repair job and none is available. If an ordinary monkey wrench of suitable size and a coarse file are at hand, a substitute may be made by placing the file against one of the jaws of the wrench. Put the wrench and file on the work and tighten the jaws by hand as much as possible.

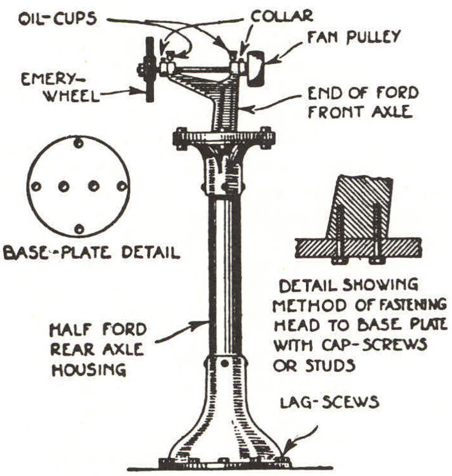
An old wrench, the jaws of which are not quite parallel, will serve better than a good wrench. It is surprising how well this makeshift pipe wrench will work.—F. L. S.

Polishing-Head and Stand Made from Old Auto Parts

A SMALL polishing-head and stand can be constructed from discarded Ford parts at very little expense.

The stand is one half of the rear axle housing, lag screwed to the floor with the differential housing down. The top flange, against which the brake drums formerly revolved, should have four holes drilled about its circumference at equal distances. Cut out a heavy iron plate the same diameter as the flange and drill four holes to correspond and two larger ones in the center, as shown.

Next, saw off one of the spindle bearings from a front axle, so that when it is set upon



This rigid pedestal grinder costs little

the sawed end the two bearings will be exactly horizontal. Drill two holes in the sawed end to match those in the center of the plate and tap them for long cap screws or studs. Fasten the bearings to the plate and the plate to the flange. Welding the joint of the bearing to the plate will make an even stronger job.

A small shaft can easily be found for the polishing-wheel. Provide two collars with set-screws to hold it in the desired position.

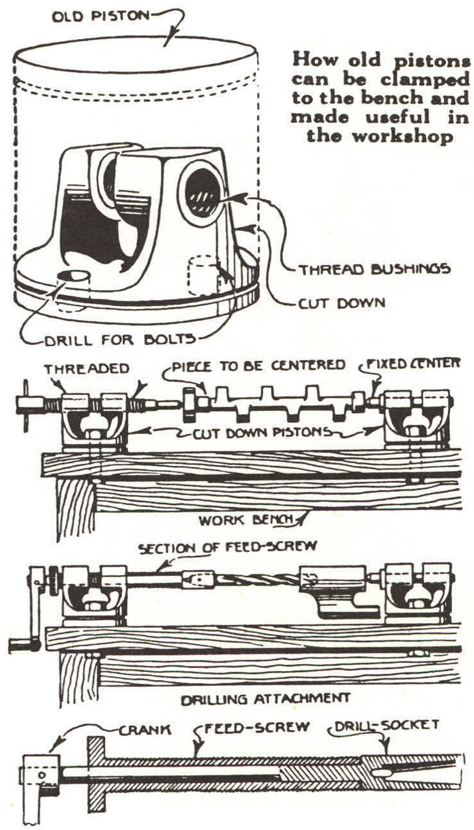
Fit an old Ford fan pulley to the end of the shaft projecting from the vertical arm of the bearing-piece and thread the opposite end of the shaft to accommodate two disks and a nut by which the polishing-wheel can be secured in place. Drill and tap for two oil-cups, one over each bearing.

Small emery-wheels and buffers can be used on this outfit as well as a fan. It will do the work of a commercial machine without costing nearly as much.—L. B. R.

TAPS, DRILLS and reamers can be reduced in size from .005 to .01 in. by immersing them in a solution of nitric and sulphuric acids. The amount of reduction depends upon the time they are left in the bath.

Pistons Become Serviceable Bench Centers

SERVICEABLE bench centers can be made of two pistons from an engine. The arrangement of these pistons is shown in the illustration. They are sawed down to leave only the wristpin bearings and permit of setting two bolts



How old pistons can be clamped to the bench and made useful in the workshop

through the head of each for clamping them to the top of the workbench.

To one piston a fixed center is attached, while in the other is placed an adjustable center threaded into the wristpin bushings. These centers are of service in truing up parts or holding them while filing or fitting them. By fitting a screwed bearing with separate shaft, crank, and drill socket, jobs of drilling can be done in this fixture.

Rubber Buffer Will Protect Woodwork from Mallet

FOR driving parts of furniture together, I use as a buffer between the surface of the wood and my mallet or hammer a heavy piece of rubber. It is simply a rubber hockey puck with a hole bored in one side and a handle inserted.—S. B.

Circular-Saw Attachment for Bench-Grinder

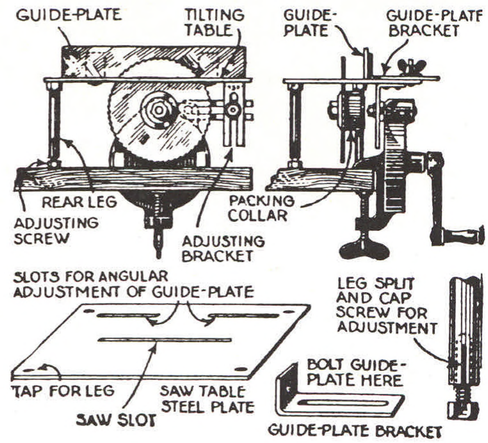
THE sketch shows a useful attachment for a small hand-power bench-grinder that converts it to a hand-power circular saw and the home mechanic will soon find many uses for one. The grinding wheel is removed and a small saw clamped in its place; usually a packing collar will be required to make up for the narrow width of the saw.

A saw-table is made up of steel or iron plate about ⅛ in. thick, or, lacking this, a maple or other hardwood board will answer the purpose. This table is made tilting by screwing two legs at its rear end and a slotted bracket at the front end. The bracket is bolted, with a thumb-nut, to the grinding-rest bracket provided with the grinder.

As the legs rest directly upon the bench, to allow for any unevenness of its surface, a cap screw is screwed into the lower end of each leg and to obviate the use of locknuts, the legs are split and pressed together before inserting the cap screws. They will then enter tightly and will not work loose.

For light sawing, this being all that the attachment is designed for, the table will be firm enough, though if thought necessary, the legs could be attached to two small angle brackets screwed to the bench, thus anchoring the table at three points.

A guide-plate, preferably with an angular as well as a parallel adjustment, will be needed, and an easily constructed one is shown. The plate itself is of steel or hard wood and is held vertically by means of two brackets bolted to it. The long horizontal bracket arms are slotted so that the guide-plate may be slid along the table axially



If you have a hand-power bench-grinder, you may easily convert it to a circular saw for small work

with the saw and clamped in any position. To allow of angular adjustment, two slots are also cut in the saw-table through which the bracket bolts extend. These allow of the table's being shifted around at an angle with the saw.

Another way to rotate the guide-table would be to remove the bolt from one bracket and allow the table to swing on the other as a pivot.

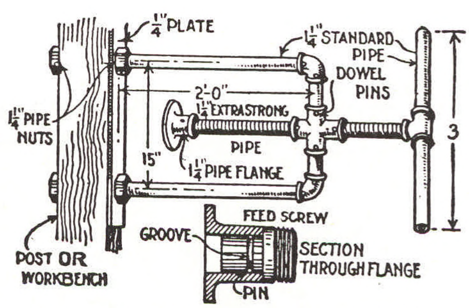
As but one bolt and a thumb-nut are needed to attach the saw-table to the grinder and one more nut to clamp the saw in place, it will be seen that the attachment may be quickly set in place and removed, and for intermittent, light, accurate sawing, such a device is much simpler and more compact than a power-saw of greater capacity.—H. H. PARKER.

Pipe Fittings Form Powerful Press

A CLAMPING, gripping and pressing fixture of ample size is a valuable addition to the home workshop. It saves straining the vise jaws, takes work that cannot be accommodated in the ordinary vise and does away with the necessity of improvising clamps.

The fixture illustrated is made up entirely of pipe fittings and can quickly be put together by any mechanic who possesses pipe cutters and threading dies. It is attached to a vertical post or to the bench, if preferred. Two similar clamps on adjacent posts are useful when long stock is to be handled.

A reinforcement of either ¼-in. steel or iron plate is essential under the clamp. The two pipe columns pass through the holes bored in the post and are secured by nuts on either face. They support a cross member that is connected to them by means of elbows and has a cross pipe connection in the center. Threaded into this is the feed screw, the upper end of which terminates in a pipe tee and two lengths of pipe to serve as the handle. The opposite end of the screw is fitted with a loose pipe flange secured with a pin.



A rugged, cheaply made fixture of wide utility in the small shop

Variations from the sizes indicated may be made, and smaller or larger pipe and connections may be substituted. The joints are treated with red or white lead and secured with drive-fit dowels.—S. N.

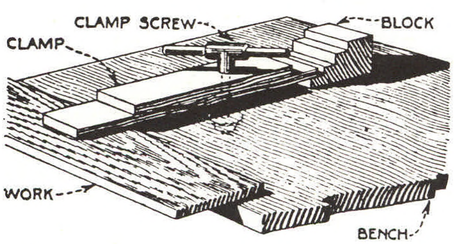
Novel Clamp for the Home Workbench Saves Time

By L. Hahner

FOR 10 years I have been using the clamping device illustrated on my workbench. It has saved much time and simplified a variety of operations. Any one who will take the trouble of making a similar attachment will find constant use for it.

It is constructed of two strips of hard wood about 3 in. wide. One should be a few inches less than the width of the bench; the other, about half as long, is nailed to the upper side of the first piece to keep it from bending.

At a point about two thirds the width of the bench from the front and the same distance from the lower end of the bench, drill a hole through the bench to receive the clamp screw. This can be simply a piece of ¾-in. pipe about 8 in. long, with a



Supplementing vise and handscrews, this cheaply made clamp has many uses in bench woodwork

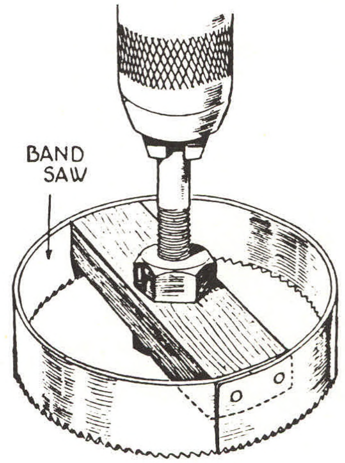
long thread at one end and a short one at the other. Into the latter a pipe T is screwed firmly and a suitable handle inserted. The long thread engages an iron floor flange secured to the under side of the bench. The hole through the clamp for the pipe is located so that the end of the long arm is flush with the front edge of the bench. The short arm is supported at various heights by a step-shaped block of wood.

The clamp can be swung in any direction and, if in the way, detached in a few moments. It can be adjusted much more quickly than a handscrew, since only one screw has to be manipulated, and it is particularly useful for holding work that would be difficult to handle in any other way. For instance, if I wish to fasten a small board to the center of a wide one for drilling holes and driving screws, this clamp will hold the two together where the vise and handscrews would not serve. I often have to rip strips 1 in. wide, and this clamp holds them conveniently and securely. It is also valuable in assembling apparatus on a baseboard.

The Way to Cut Large Holes in Wood

ALTHOUGH this method of cutting large holes may be used for cutting thin metal, and even glass, it is more practical for use on wood, especially where such devices as clocks, ammeters, etc., are to be installed on the dashboard or instrument board of an automobile.

Obtain an old strip of band-saw and draw the temper by heating it to a



A strip of band-saw bent into a circle and riveted will cut any size hole

red heat in the fire, then letting it cool. The saw may then be bent into the circle desired and the ends cut and riveted to make a complete circle. After this is done, round off both ends of a flat piece of oak board to fit the inside of the circle and with four brads, fasten the circle to the board. Find the center of the device and pass a bolt through the board, thread on a nut, and it is done. It may be used in a bit-brace and will cut a perfectly round hole.

If more than one hole is to be cut, or if the device is made for use in the garage, the saw should be tempered again after it has been bent and riveted. To do this, heat to a bright cherry red, quench in water and draw the temper by holding for a short time in the heat, until the metal turns to a dark blue.

A Cutter for Making Large Holes

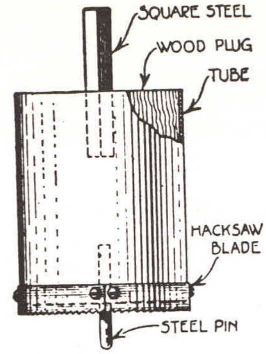
CUTTING large holes in sheet metal is sometimes quite a problem when the metal is too heavy to work with shears, or the hole is not large enough.

A highly satisfactory tool can be made for the purpose in the following way:

Take a piece of brass or steel tubing of a diameter about 1/16 in. smaller than the size of the hole. Plug one end with hard wood, carefully square up the plugged end, both wood and tube, accurately mark the center, and insert a steel pin about ¼ or 3/16 in. in diameter, letting it project about ½ in.

Have the pin tight in the wood and well supported.

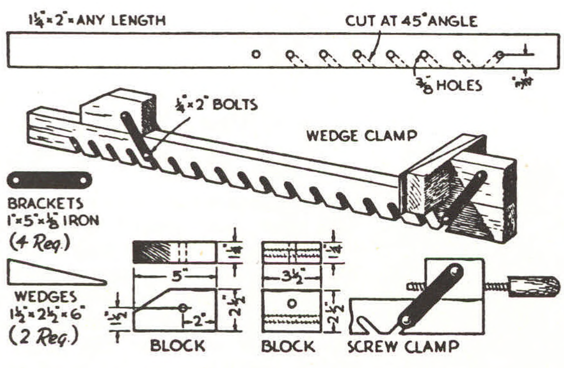
Take a hacksaw blade with fine teeth and cut it to such a length that it will exactly encircle the tube, the ends coming close together. Secure the blade to the plugged end of the tube with small machine screws tapped into the tube, allowing a little more than half the width of the blade to project below the plugged end. Use at least five screws—one in each end of the piece of hacksaw blade and the other three at equidistant points; if the tool is large, use more screws. An important point is that it will be found necessary to draw part of the temper of the blade before it can be bent and drilled, but the softening process should not be carried any further than is necessary. Heat the blade on a piece of flat iron, or in an iron pipe, held over a Bunsen burner or other gas flame so the heating will be even. If the blade is too soft, the teeth will not last long; while if it is made too hard, it cannot be drilled and will break when an attempt is made to bend it.



A hacksaw made into a circle will cut any size hole

It will be necessary to do a little experimenting and to spoil a few blades before just the right result is obtained. To use the tool, drill a hole in the sheet metal for the steel pin, making the hole so that the pin will fit without lost motion; put the tool in an ordinary brace, insert the pin in the hole, and turn. The hole will be smooth, clean, and true. Not much pressure is required. A good way to attach the cutter to the brace is to plug the upper end of the tube in the same way as the lower end and insert a piece of square steel that will fit the chuck of the brace. Drill a hole somewhat smaller in diameter than the diagonal of the square steel and drive steel into place.

WOODEN GLUING CLAMPS

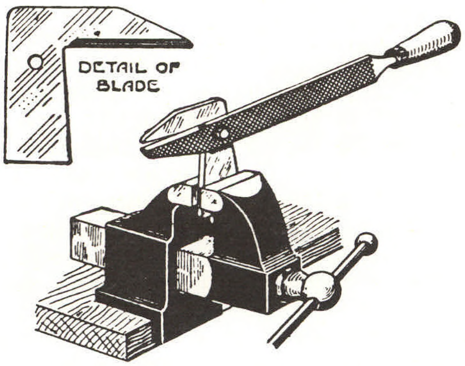


ADJUSTABLE gluing clamps of any length can be made from hardwood as shown. Wedges may be used to apply pressure, but if a wood-cutting tap and die are available, it is more convenient to use a wooden screw unless the work is very thick, in which case the wedges are better. A pair of similar but smaller clamps with bars about 1" by 1¼" by 24" are useful for repair work and small jobs.

You Can Make This Vise-Shear without Cost

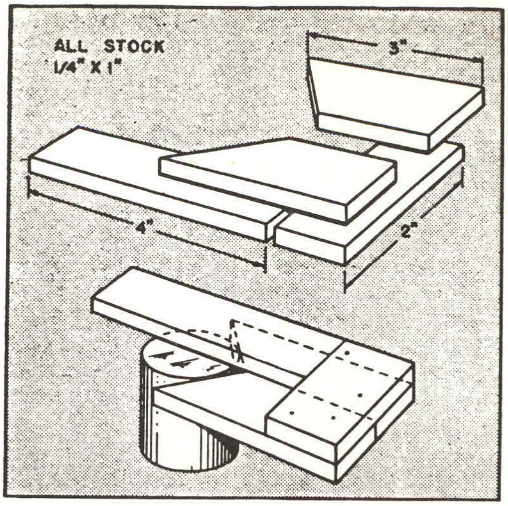
THIS simple, home-made device is one that is well worth the making, and as it is made from a piece of flat steel and an old file it costs only one's spare time.

The stationary blade is shown in detail and is made from a piece of ⅜-in. flat steel. The moving blade is made by drifting a hole through a



An old file and a piece of flat steel makes this handy vise-shear

flat file that has been previously heated to a cherry red; then the file teeth on the cutting side are ground off and the cutting edge ground on. Now simply assemble the parts with a bolt and nut and the tool is complete.—CHARLES H. WILLEY.

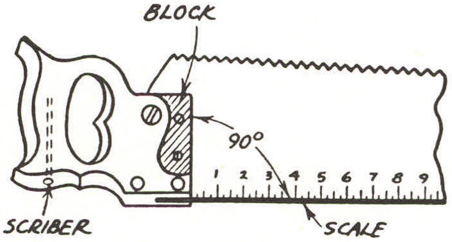


Center Finder Works Quickly

WHILE making some small turnings, I hit upon this idea for locating the center of round stock. It works like a charm.

Using ¼″ hardwood, rip a strip 1″ wide and about 15″ long. Then cut off one 4″ piece, two 3″ pieces, and one 2″ piece. Miter each 3″ piece to 45 deg. at one end, and assemble all the pieces as above, tacking them together with or without glue.

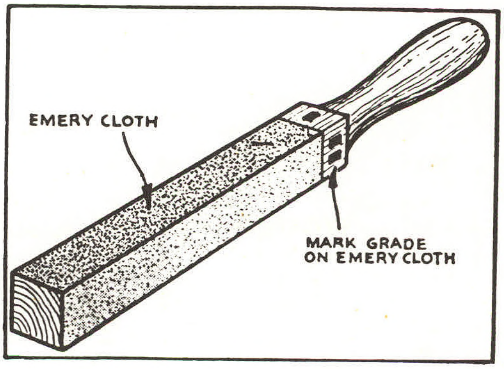
With the device held on the end of the round stock as above, scribe a line close along the 4″ strip. Revolve about 90 deg. and scribe a second line. The lines will always intersect at the exact center of the work.—*J. W. Jay, Palmyra, N. J.*



SAW CONVERTED INTO TWO TOOLS

By Roy F. Kaiser

The usual crosscut saw is used but the back edge is ground perfectly straight and its handle set so that it forms a right angle with the back of the saw. Filler pieces are then added to the handle as shown by the shaded section. A further asset is the scriber which is fitted into a brass tube recessed into the handle. By etching a scale in the back of the blade, the saw can be used as a square having double the range of an ordinary square and eliminating the procedure of laying down the saw and picking up the square. This will save considerable time and necessitates only carrying one tool.

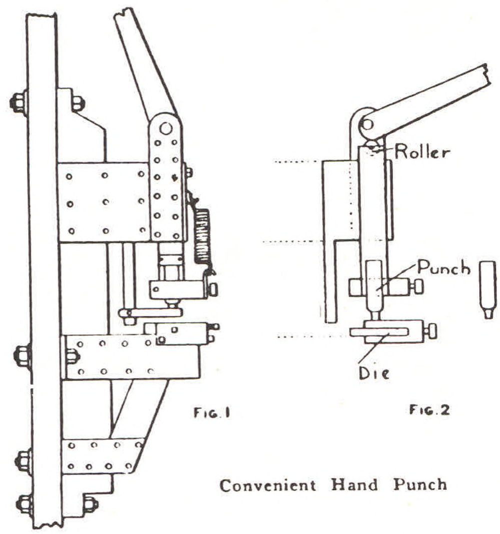


Convenient Emery "Stick" Has Four Grades of Abrasive

FOUR grades of emery cloth glued to a 12″ piece of 1″ by 1″ wood stock will give you an emery "stick" that will be found useful in model making as well as in other small jobs in the home workshop. Whittle a handle on one end of the stock, and then glue the emery cloth to the four sides in 1″ strips, marking the grade of each side near the handle. When a piece becomes badly worn, it can be removed by soaking in water if ordinary glue was used.—R. E.

IMPROVED HAND PUNCH

The accompanying engraving shows a hand punch designed by a correspondent of the American Blacksmith, who writes: I have already made six of these machines, and they work fine. I have one that punches



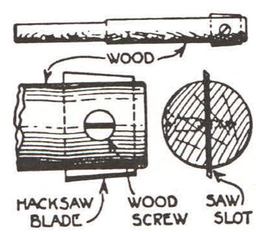
Convenient Hand Punch

½-in. holes in ¼-in. iron, and does it so easy and fast that I cannot see how any smith would want to do without it. This punch is better and cheaper than any I have ever seen and I am going to build them in quantities and place them on the market. I make them in four sizes to punch from ⅛ to ½-in. holes in ¼-in. iron, and I think I can make one that will punch ½-in. holes in ½-in. iron. This tool is certainly too good to let go. It can be sold for about half the price that is asked for other cast-iron punches and it cannot be broken. Any smith can make punches and dies for it to suit any job he may have on hand.

Improving a Reamer in an Emergency

A VERY useful emergency reamer can be easily and quickly made from a stick of hard wood, a piece of hacksaw blade, and a short wood-screw.

The piece of hard wood (hickory preferred) should be turned down until it will just turn easily in the hole that is to be reamed, and should be long enough to allow one end of it to be inserted into the drill-chuck or carpenter's brace.



A piece of hacksaw blade and a stick make this reamer

At the other end a slot should be sawn with a thin hacksaw. This slot should be deep enough to allow the saw-blade to be about ⅛ in. from the end.

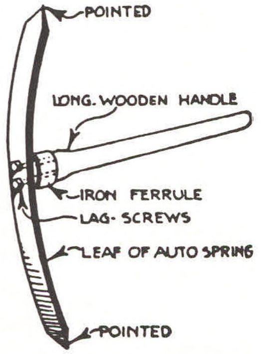
Now take a piece of hacksaw blade of a length to make the proper-sized hole, grind cutting edges on each end of it and insert it in the slot in the position shown. If the cutting edges are ground with a slight taper they will cut and feed better.

A common, short wood screw may be used as a set screw if so desired, although it will not be needed if the blade is made to fit tight enough.

Auto Spring-Leaf as Pickax

A PICKAX for breaking up soft soil can be made from one leaf of a discarded automobile spring.

Remove the leaf that appears to be the stiffest, and grind down each end to a point on an emery-wheel. Then drill two holes in the center. Bolt the leaf to the end of a stout handle with long, thin lag-screws.



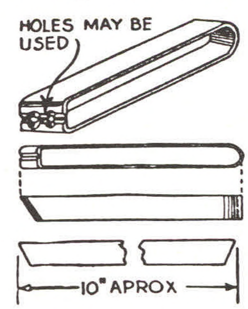
For light garden work

The head end of the handle must be reenforced with a ferrule so that the screws will not split it.—L. R.

Tool for Removing Insulation Made from Hacksaw Blade

AN OLD machine hacksaw blade may be made into a time-saving tool for stripping insulation from wires.

Cut the blade to a length of about 10 in., making the cuts at an angle of 15 or 20 degrees, as shown. Then grind off the teeth. Heat the ends and bend them up for about ⅜ in. When cool, grind a blunt cutting edge on each of the upturned edges, with the bevel on the outside.



For stripping insulation speedily

Next, heat the blade in the middle and bend together until the cutting edges touch; then restore the temper to the tool. This tool may be left with straight cutting edges or holes may be cut in the sharp edges.—S. W. B.

Gasket Cutter Made Cheaply from Pipe and Fittings

By Frank N. Coakley

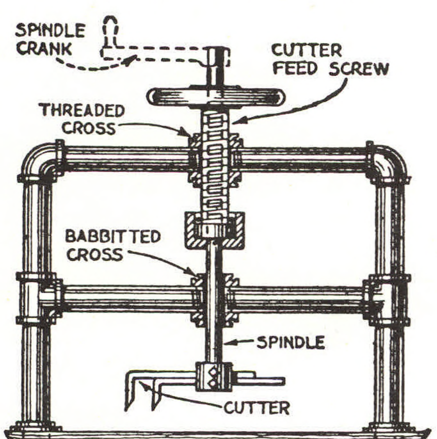
STEAM-FITTERS and pipe-fitters generally need a cutter for preparing gaskets, as the jack-knife method is slow and unsatisfactory. When a commercial cutter is not at hand, a substitute can be made from standard, easily obtained parts.


Although cheaply made, this is a good sturdy gasket cutter

The frame is made as shown, from standard 1½-in. pipe and pipe fittings. It is fastened to the workbench with pipe flanges.

The feed screw is a piece of the same size pipe threaded the full length. A common valve wheel is fastened to the top of the feed screw. Attached to the lower end of the screw is a collar, which acts as a pull-back for the cutter spindle. A 1½-in. pipe cross serves as the nut for the feed screw.

The driving spindle is made of cold-rolled steel large enough to fit snugly within the feed screw. A cup-shaped washer is pinned to the spindle so as to fit over the collar on the screw. Two pins, one each side of the screw, are forced through holes in this collar, as indicated. The middle cross is babbitted to suit the spindle.



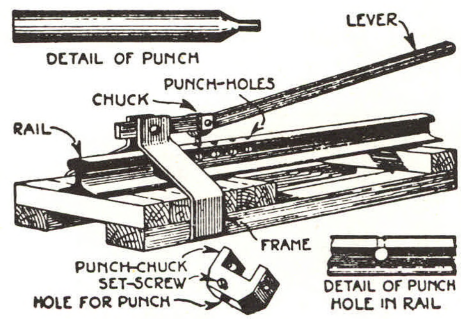
The cutter spindle passes through the feed screw, which is a threaded length of 1½-in. pipe

The cutter head is made from round stock with holes for the cutters and setscrews. The end of the spindle is squared to receive a crank.

Constructing a Powerful Punch for the Small Shop

WHENEVER it is necessary to punch a number of holes in sheet or bar metal not more than ¼ in. thick, a serviceable homemade punch may be constructed at little cost.

Obtain a rail about 3 ft. long and drill a series of holes in it 2 in. apart, from 1/16 to ½ in. in diameter, deep enough so that the drill is exposed alongside the central web of the rail. This will provide chip holes, although for the very small diameters it may be necessary to drill into the web at right angles to provide chip outlets.

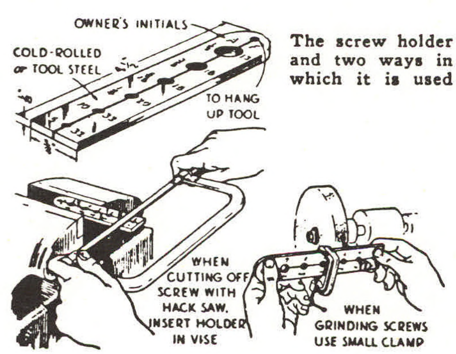


A 3-ft. length of rail forms the bed of this cheaply and easily made shop punch

A 5-ft. length of 1-in. wrought bar iron 1½ in. wide forms the lever. This is heated, bent, and attached as shown. The punch chuck is made from a 1 by 2 by 2½ in. block of iron.

The punches are ⅝-in. stock, 5 in. long, tempered or casehardened, depending on the material. All of the bolts should be of high grade steel to prevent shearing.—P. H.

PLATE GIVES GOOD GRIP ON SMALL SCREWS



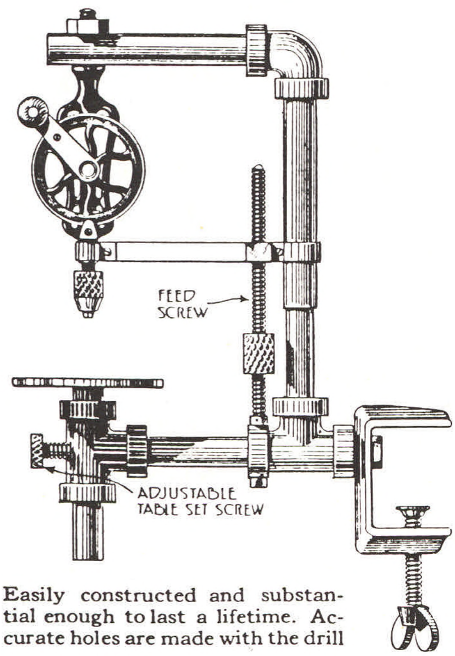
The screw holder and two ways in which it is used

SMALL screws and bolts can be securely held by the method illustrated while any operation is performed on them. The holder is either cold-rolled or tool steel, about 4½ by ¾ by ⅛ in. Holes should be drilled for the screws most commonly used about the shop. After the holes are drilled and tapped, the tool should be slotted through the center with a hack saw. One advantage of the tool is that the amount to be removed when grinding or sawing is easily adjusted.—R. C. D.

Making a Drill-Press from Old Pipe and Fittings

WITH a few pieces of gas-pipe and fittings a very useful drill-press can be made.

Take a piece of gas-pipe, 10 in. long, with one end of it threaded and a 90-degree L fitted to it. To this couple another piece of pipe 5 in. long. About half an inch from the end of this, drill a hole the size of the screw on your hand drill, from which the handle has been removed, and find a nut to fasten it on the top. Now take a piece of strap-iron 1/8 in. thick and bend this around the longer piece of pipe. Make it tight with a bolt or rivet, so that you can bend the other end of it around the drill, as seen in the drawing. Be sure that the drill is now in a vertical position.

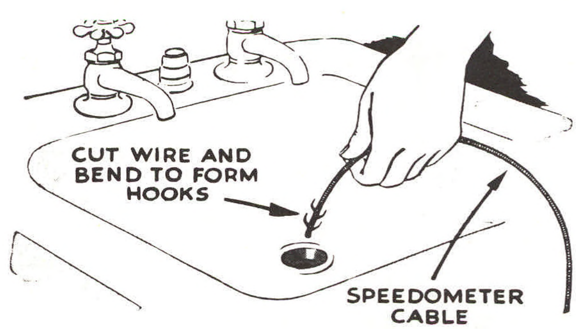


Easily constructed and substantial enough to last a lifetime. Accurate holes are made with the drill

Now take a piece of gas-pipe about eight inches long and of such diameter that it will slide into the 10-in. pipe. Grind out and polish the two pipes and you will get a very good fit.

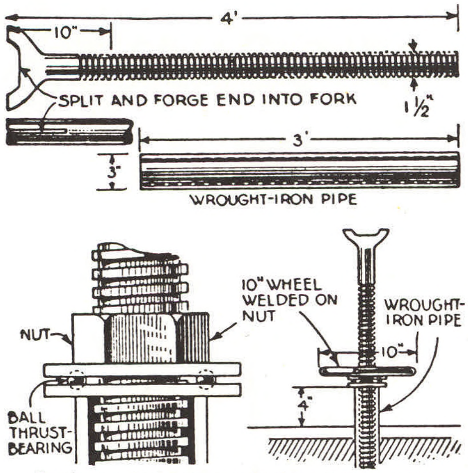
Connect this smaller diameter pipe with the outlet of a T-joint. Now attach a second T-joint to the first with a piece of pipe of sufficient length so that the opposite openings correspond with the center of the drill. Through this second T-joint run a piece of round iron or pipe, onto which fasten an iron plate (a cover from a kitchen stove will do), for the table to rest your work on. Put a thumbscrew in the middle of the T for fastening the table at the desired position.

For the feeding mechanism procure an iron bolt about 8 in. long and 1/4 in. thick, with half of its length threaded. Now drill a hole the size of the bolt perpendicularly in the short piece of piping, between the two couplings, and about an inch from the first one, and insert the bolt into the hole. Above, close to the piping, fasten a collar, as seen in the drawing. Place a knurled adjusting screw at the middle of the unthreaded part of the bolt. Now run the nut on the bolt up to the connecting arm and fasten it to or between the strap-iron bracket. By turning the adjusting screw the upper part of your drill-press can be raised or lowered. For fastening the drill-press to a table or a bench, attach a common clamp to the remaining open coupling.—STEVEN NAGY.



By unwinding 1" or so of the cable wire wrapper of an old speedometer cable and bending it to form hooks, you can make an excellent tool for removing objects from a drain that has failed to respond to customary grease solvents.

Ball-Bearing Stationary Jacks for the Garage



Stationary jacks are a valuable equipment for the garage and safer than movable jacks

ONE of the most desirable features of garage equipment is a means of hoisting either the forward or rear ends of the car enough to bring the wheels 2 ft. above the floor. This permits of the periodical repair of the chassis and makes it possible to get underneath readily for cleaning, greasing, and inspection, which work is neglected where the owner is obliged to get down on the cold dirty garage floor.

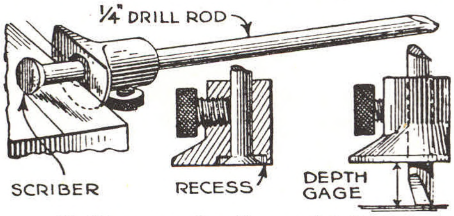
If two 3-ft. lengths of 3-in. iron pipe are embedded in the concrete floor at the time the floor is placed, leaving the ends protruding about 4 in. above the floor level, two removable screw-jacks with forked upper rests can be used to elevate the car to the desired position. These jack-screws are made from bar stock 1 1/2 in. in diameter and the forked rest is forged out of the end of the bar. It is desirable to have the thread lathe-turned on the bar, making a square thread with a screw lead of about 3/8 in. The lifting-nut should be made of corresponding thread, and for convenience in turning a rim about 10 in. in diameter should be welded to the nut.

Two ball thrust bearings (for ease in turning the nut on the screw) are placed between the pipe and the nut. While the threads can be put on the bar with a die, the pitch is usually low and more time is required to raise the car. The space between the elevating jacks should be made the same as the distance between the outer frame members of the car's chassis. The cost of these fixtures will be low, as the threading can be done in any machine-shop. The ball thrust bearings need not be new; suitable parts can be purchased from dealers in second-hand material.

Keep the threaded bars well oiled and the device will work smoothly and fast. In lowering the car, a steep pitch thread will practically lower itself; the nut is given a quick turn, and the weight above tends to keep it spinning until the car wheels are on the garage floor.—G. A. LUERS.

Round-Blade Scriber Is also Useful as Depth Gage

THE scriber shown is excellent for marking parallel lines. The beveled edge cuts a sharp, true line of uniform depth and width, and when the tool be-



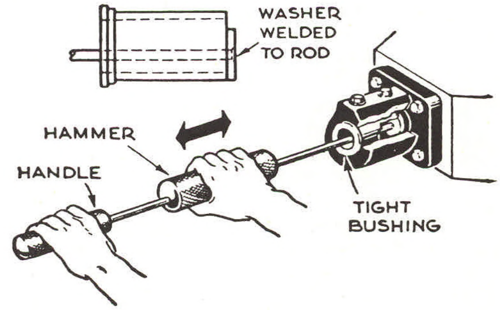
Useful as a scriber for parallel lines, this tool serves also as a depth gage

comes dull, a slight turn of the rod presents a new cutting face. Not until the edge has been turned all the way around does it require regrinding.

By reversing the rod in the holder, the tool becomes a convenient depth gage.

After the tool has been used, the rod is pushed back until the cutting edge of the scribing disk is sunk flush into a recess, which protects the edge from damage or injury.—H. S. L.

BUSHING EXTRACTOR. When a tight bushing can't be driven out from the back, the tool shown below will pull it. The welded washer is inserted in the bushing from the front and hooked over the edge, and the sliding hammer is then brought sharply against the handle several times until the bushing loosens and comes out. Carl Bagford, of Cedarville, Ohio, devised the tool for removing bushings from a lathe turret when setting up new work. The tool was first described in *Blue Chips*, a publication of Warner & Swasey Co., of Cleveland.



Removing Gears with a Puller

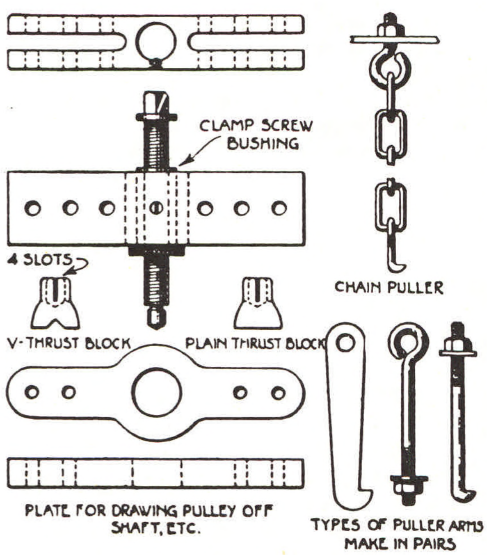
BELOW are illustrations that show the construction of a device which will be found useful around the small shop or garage for pulling gears, pulleys, or collars off shafting and a variety of similar work.

The body of the puller is made of a piece of square cold-rolled steel, drilled for the clamp-screw bushing and slotted as well as drilled for various sorts of pulling arms.

As there would be considerable wear in the threads of this kind of a fitting, a removable nut of bronze or gun metal is shown, being made a drive fit into the body and held by a small set screw. In case the bushing wears, it may be driven out and a new one substituted.

The screw has a square head for a wrench and it would be well to harden the head as well as the point. Sometimes the point will bear directly upon the work; at other times a thrust block interposed would be best.

Two types of thrust blocks are shown, one with a flat face, either roughened or smooth, and one with a V-groove for bearing against curved surfaces. The small



Jiggs for removing gears, pulleys, or collars from shafting

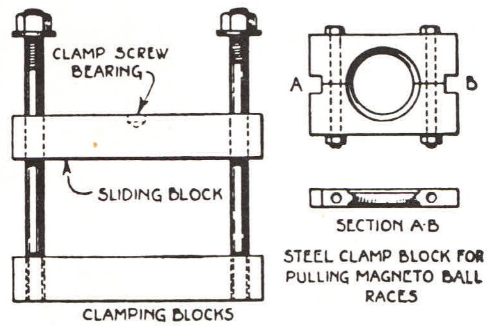
ends of the thrust blocks are drilled to take the end of the screw and are slit in four places with a hacksaw. A groove is turned just above the point of the screw and the slit ends of the thrust block slightly bent in so that it will spring over the screw point.

The pulling arms are made in pairs; one form is a plain hooked type filed from flat bar steel with the upper end drilled for a pin.

Another kind is a hook bolt, the nut and washer bearing upon the top surface of the body and the bolt extending through the groove. Such arms may be adjusted for unequal lengths, if required.

Another form is the plain eye-bolt; either the eye is held by a pin through one of the drilled holes in the body, the bolt extending through the part to be drawn off and secured by nut and washer, or the bolt may be reversed, the eye being secured to the work and the nut bearing upon the body as in the case of the hook bolt.

Sometimes a couple of chains are more convenient than solid arms; the upper links may be held to the body by pins or by eye-bolts. Chains are adapted to irregular shaped work or for pulling a part at some



This clamp-block is very useful for pulling ball races from magneto shafts

distance from the clamp screw. A steel plate yoke frequently is useful, especially if the center is drilled for slipping over a shaft, and the arms are drilled for the bolts serving as pulling arms. Such a yoke may be slipped behind a pulley or gear and the part removed without danger of damage that might occur if the arms were attached directly to the rim.

Another illustration shows a pair of clamp blocks and two bolts serving as arms and attached to the clamp screw block. One block slides and is drilled for a bearing to take the end of the screw; the other is drilled and tapped for the arms. Work is clamped between the fixed and sliding block.

To conclude, a small fitting is shown that has proved very convenient for pulling the ball races from magneto shafts. It is in two parts, bolted together and bored out to take the race, over which it is clamped while the puller arms fit into the end notches.

Such races are difficult to remove, without injury, unless some special fixture of this sort is used.—H. H. PARKER.

¶Corn meal will be found helpful in removing grease from the hands if rubbed on after working up a lather with soap.

Novel Glue-Spreader Cheaply Built

By A. E. Elling

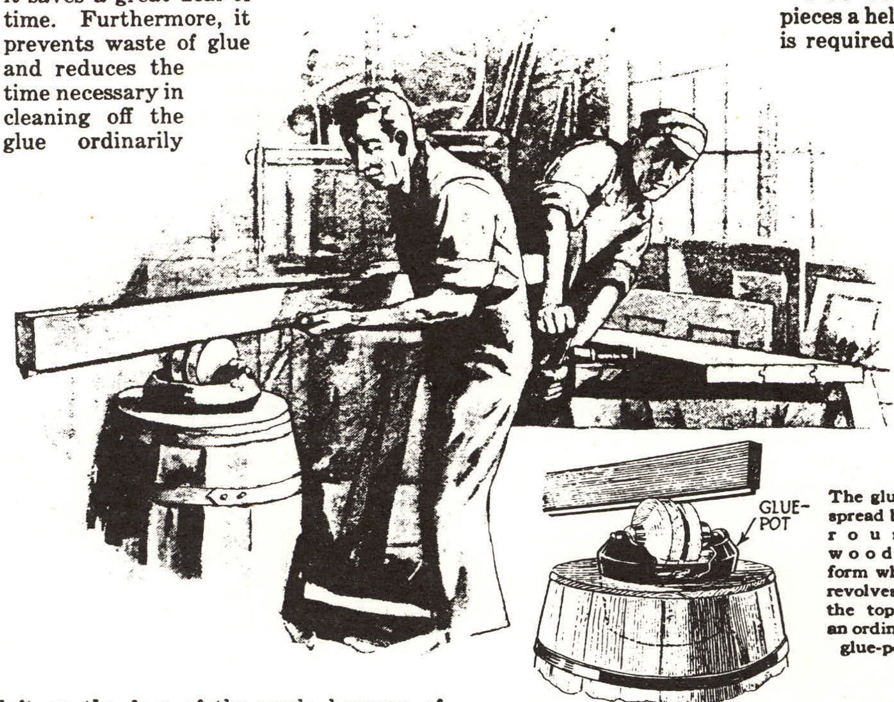
A MACHINE for spreading glue on the edges of boards, built as shown, will pay many times over for the slight cost and labor required in its construction.

As compared with using a glue-brush, it saves a great deal of time. Furthermore, it prevents waste of glue and reduces the time necessary in cleaning off the glue ordinarily left on the face of the work, because of the unequal brush distribution.

The glue reservoir is merely a large outer glue-pot, which is filled with hot glue from another container as often as necessary. This pot is set into the head of an empty nail keg, which is ballasted with junk iron or other weighty material.

The glue is spread by means of a wooden turning which revolves freely. This may be plain or shaped to suit a tongue-and-grooved, rabbeted or any other style of common edge joint. The bail is removed from the glue-pot and the turning is fastened loosely with screws through the holes in the bail ears. The turning should not be so large nor fit so tightly in the pot that the glue cannot drain back freely.

For long pieces a helper is required to hold up one end as the work is pushed over the spreader.

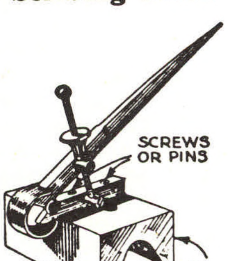


The glue is spread by a round wooden form which revolves in the top of an ordinary glue-pot

Any one accustomed only to the brush method of applying glue will be surprised at the neatness, quickness, and cleanliness of this inexpensive machine.

Machinist's Dividers Utilized in Making Small Scribing Block

A SCRIBING block capable of fine adjustment may be made by cutting off one of the legs of a heavy type of machinist's dividers and fastening the tool as shown to a V-block by means of two small screws or pins.



The scriber will be found especially useful for small work because of the convenient screw adjustment illustrated.
—WILLIAM J. EDMONDS, JR.

SIMPLE SCREW HOLDER

THERE are many screws about the auto that are so placed that it is extremely difficult to start them in the hole. The simple tool shown in Fig. 3 will make child's play out of such a job. Take a piece of flat iron or brass strip and bend the ends as shown. Slot one end to the diameter of the largest screw and fit two screw eyes by riveting or soldering.

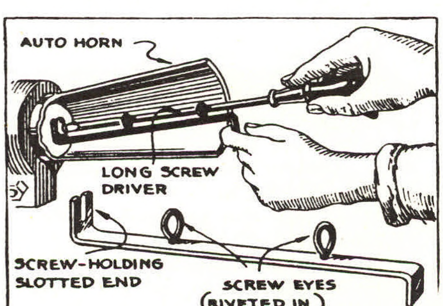


Fig. 3. A slotted piece of flat iron or brass strip serves as a good and simple screw holder.

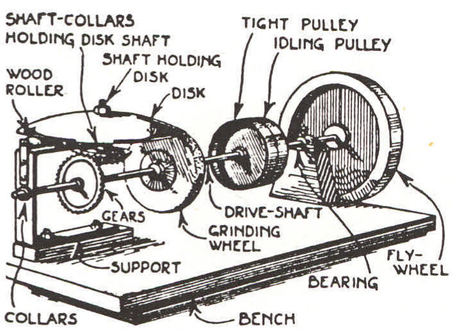
You Can Make this Disk-Grinder Yourself

By L. M. Jordan

OUTLINED in the illustration is a disk-grinder that is simple in construction and operation and grinds the disks automatically.

Procure a piece of 1-in. shafting, 6 ft. long. This shaft is mounted in a box bearing near one end on a mounting attached to a bench as shown, and the other end passes through a 1-in. hole in the center of a piece of malleable iron 1 in. thick, 3 in. wide, and 3½ ft. long, bent into the shape of the letter U. This iron lies on a block mounting on the bench, which is lower than that supporting the box bearing at the opposite end.

The lower side of this U-shaped stud is fastened to the block support and the bench with two heavy bolts drawn tightly. Through another hole in this stud extends a short piece of the same size shafting 10 in. long, 2 in. of the upper end of which are threaded for a retention nut. This short shaft is held at the proper height by two shaft collars. On the lower end of this shaft is mounted an 8-in. gear in an inverted position, beveled for right-angle driving. This gear is engaged by a similar 6-in. gear mounted on the drive-shaft as shown.



With a little skill and few tools you can make an automatic disk-grinder

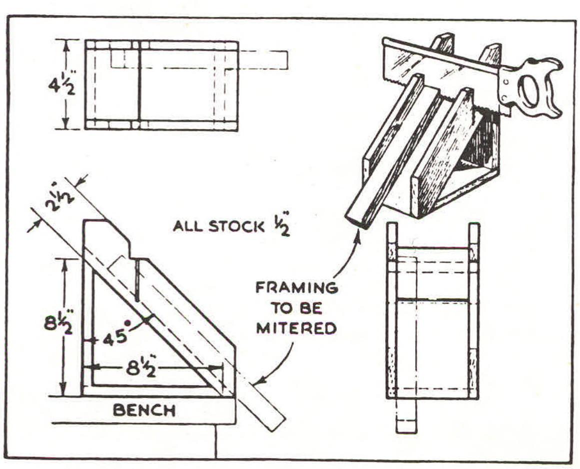
A small wooden roller is mounted on the U-shaped stud in brackets made of strap-iron and riveted to the stud. This roller holds up one side of the disk level and the opposite side rests on the top face of a 3-in. emery-wheel mounted on the drive-shaft under the disk as shown. An inch of the short vertical shaft immediately under the threads is hammered square to fit the square hole in the disks. The disks are put on this shaft in an inverted position and a nut is screwed on to prevent them from coming off the shaft during the grinding.

The drive-shaft is prevented from playing back and forth in its bearings by two shaft collars, one on either side of the disk support piece or U-shaped stud. The hole in which the shaft rests in this piece is its bearing at this end, and should be kept well oiled.

Near the box-bearing mounting two small pulleys are mounted on the drive-shaft. One idles on the shaft and the other is fastened and drives it, with a small belt from the engine or countershaft. This allows shifting of the belt from driving pulley to idler when necessary to change disks.

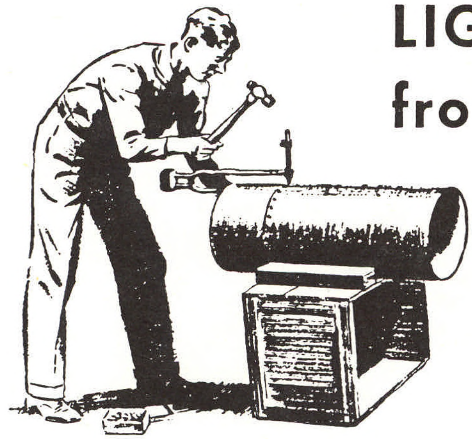
A flywheel is mounted on the end of the shaft to balance the motion and power of the grinder. The disk rotates at lesser speed than the emery-wheel and in an opposite direction. A small wooden roller supports one side of the disk, while its other side rests on the face of the emery-wheel. On account of the ratio of the driving-gears the disk does not rotate as fast as the grinder, yet fast enough to keep it cool and grind it evenly and uniformly. Many disks can be sharpened in a day with this apparatus.

Wide Framing Mitered Accurately in Triangular Sawing Jig



CUTTING 45-deg. miters on wide boards can be done accurately with a narrow miter saw used in the triangular-shaped box shown at the left. It is designed to be attached to the edge of a bench so that the piece to be mitered can extend down below the bench.

The angle of the sloping bottom of the box, between the two sides of 2½" wide stock, is 45 deg. Both sides are notched to allow space for the thick back of the saw, and the slot in which the saw slides is vertical. The width of the box can be made to suit the length of the saw and the width of the piece to be mitered. A carpenter's steel square is helpful in getting true angles.—E. L. WESTDAL.



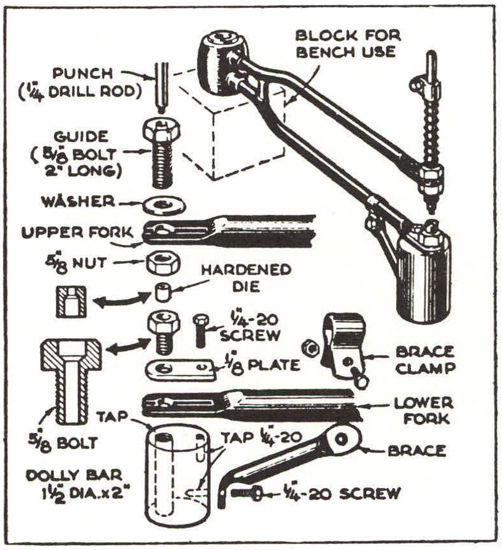
LIGHT PUNCH PRESS from a BICYCLE FORK

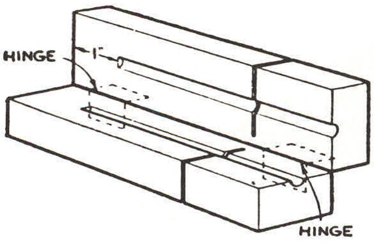
THIS little punch press, made from a rear fork of a bicycle, can be used on the bench or held by hand as the work may require. It can easily put ⅛" holes in mild steel or brass up to 3/32" thick. When it is used on the bench, a block is slipped under the crank-housing end, and a block may likewise be put under the dolly bar for additional support on large-diameter work.

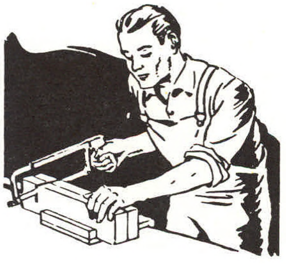
A light spring automatically retrieves the punch from each hole. It is held against a discarded auto throttle-rod clamp that is clamped on the punch over a split brass bushing. Be sure not to use a stiff spring, for it may bend the forked frame.

Punches up to ¼" in diameter can be made up of ¼" drill rod for use on light stock, and a hardened die insert may be made for each size. The inserts can be dispensed with, if desired, and the die formed in the bolt head if it is tool steel or can be casehardened. When three or more dies are needed, however, the inserts will save time.

Cut the horizontal fork from an old bicycle frame and file notches near the end of the axle slots for the ⅝" bolts. Drill through the guide bolt, making a sliding fit for the drill-rod punch, and assemble on the upper prong, as shown. Then drill the dolly bar and plate, as indicated, and assemble on the lower prong with a brace and clamp. Bend the prongs to align them.—R. S. MACNEILL.







AIDED BY THIS JIG, I recently made 100 nipples, 1½" long, from ⅝" thin-wall pipe. To make the jig, I first bored a ⅝" hole in one end of a 1½" by 1½" by 6" block of wood, extending the hole to within 1" of the opposite end. Then I sawed the block in two through the center of the bored hole. Next, I measured 1½" up from the bottom of the hole and cut a slot at that point to take a hacksaw blade. Finally, I fastened the pieces together with two small hinges so the jig could be opened to take out the cut lengths. By varying the dimensions, jigs may be made to cut any number of duplicate pieces of pipe or rod to a desired length.—O. C. SPRINKLE.

How to Make a Pair of Automatic Forceps

By Frank W. Harth

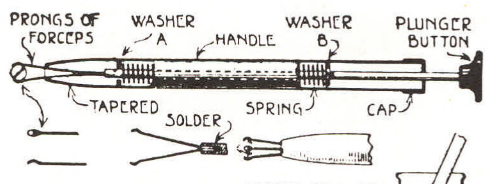
ILLUSTRATED by the accompanying diagram is a device which will be found handy for picking up and holding small articles, such as screws, bolts, nuts, etc. It may be constructed from scrap material.

The handle of the instrument can be made from a discarded metal pocket pencil from which the cap and interior have been removed. A discarded stilo fountain pen can also be used. It is essential, however, that the business end be tapered as indicated.

The plunger rod is made in accordance with the diameter of the handle and should be at least 3/32 in. in diameter. The length of the plunger rod should be approximately as shown. The plunger button can be either metal or composition. It should be securely fastened to the plunger rod, by a screw if composition, and by riveting if metal.

The forceps prongs must receive careful attention as the proper working of the instrument depends on them. Spring steel wire about No. 20 gage will prove the most satisfactory. The wire must be stiff and well tempered. The wires are soldered into a previously drilled hole in the end of the plunger rod, the soldering being done when assembling the instrument. The wires should be spread so that they have the appearance shown. The prongs can be of various shapes depending on the commodity to be picked up. The shape illustrated is a good one for general purposes and can be obtained by careful flattening with a hammer.

The spring is made adaptable to the bore of the handle shell and should be strong in its action. Its location is shown between washers *A* and *B*. Washer *A* must fit the bore of the handle shell snugly and is rammed tightly into the tapered end. The hole in the washer should be large enough to permit the plunger to slide through easily. Washer *B* is the same as washer *A* in a general way, with the exception that its outside diameter is a little less than the inside diameter of the handle shell so that it will slide up and down without binding. The hole through the washer must be the proper size so that when the washer is slipped over the plunger rod it will fit tightly. A small amount of solder will hold it securely.



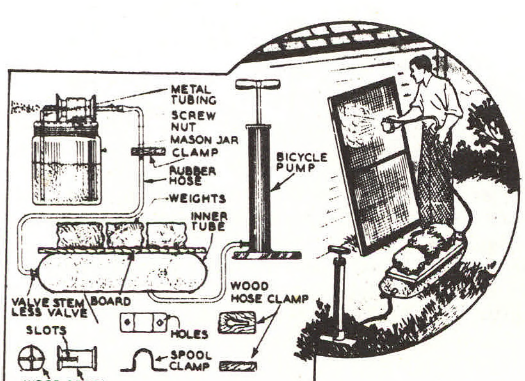
The illustration of the forceps shows construction, and also the instrument picking up an olive

The different parts are now ready for assembling. This is simpler than would at first seem apparent. The spring is dropped into place at the cap end and the plunger rod inserted. To solder the prongs in place the plunger rod is pushed through the tapered part until the drilled end of the rod comes outside. A wooden plug may be jammed into the cap end to hold rod in place while the prongs are being soldered. The work must be clean and smooth so that the rod can slide back again without binding. The cap may then be put in place. If it is of the threaded variety the problem is very simple, but if it is not, a cap must be made from tubing and a washer and soldered into place. The hole through the cap must be large enough to enable the plunger to slide easily. The plunger button is then fastened in position and the instrument is ready for use.

The instrument is simple to use. The button is pressed down and the spread prongs placed over the object to be picked up. As the button is released the plunger is forced up by the spring and the prong wires, being drawn up in the shell of the handle, come together and firmly take hold. To release the object the button is simply pushed down.

Three or more prongs can be used, depending on the thing usually handled. For precious stones a three prong instrument is desirable.

The instrument can also be used for removing the illusive olives from the long and narrow bottles in which they are confined.

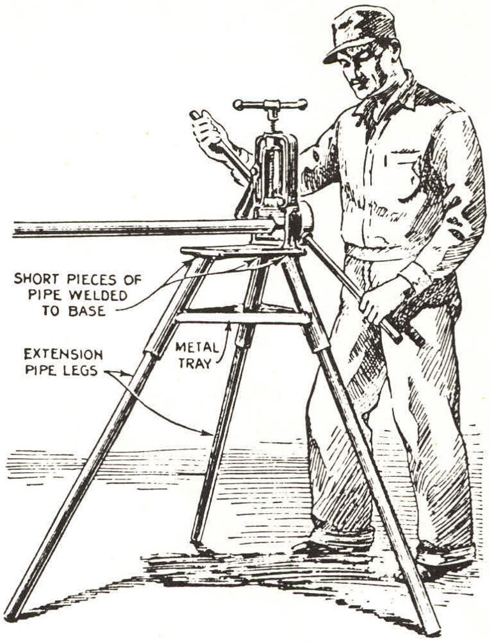


Pump Makes Handy Paint Sprayer

AN EMPTY thread spool, an auto inner tube and a small salad dressing jar are the only materials needed to build a practical paint spray for doing odd jobs about the home. Attach a copper tube to the jar lid by soldering in place. The spool serves to hold a similar copper tube rigid for the air supply. This is mounted to the jar top with a tin clamp. An old inner tube provided with an extra valve serves as an air supply for the sprayer.—L. Plebanek.

Detachable Legs Improve Portable Vise or Pipe Threader

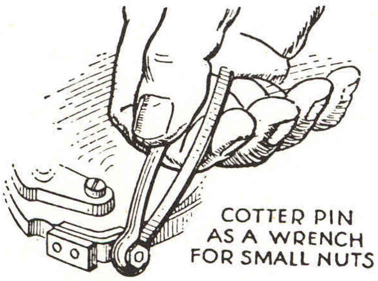
When a pipe threader, vise or similar tool is to be hauled from job to job, weld three short pieces of pipe to the underside of the base as shown. Longer pieces of pipe can then be slipped into these to serve as legs while the tool is being used, and removed when it is being transported. A metal tray welded to the legs below the base braces the assembly and serves as a shelf for small tools.—Jos. C. Coyle, Los Angeles, Calif.



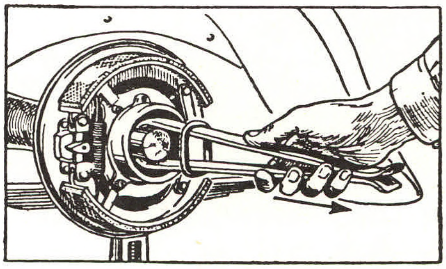
Removable Legs Are Handy on a Vise or Pipe Threader That Is Moved from Job to Job

Cotter Pin Wrench

HAVING no wrench suitable for the small nuts found on many distributors, the amateur mechanic will find that a large cotter pin can be made to serve the purpose. By spreading the legs of the cotter pin, the eye can be slipped over the sides of the nut. Pressing the legs together will contract the eye and grip the nut, allowing easy adjustment.—R. A.



By spreading the legs of a cotter pin, its head can be used to unscrew distributor nuts

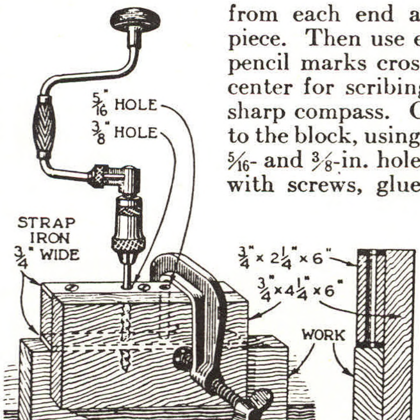


Boring Guide Makes Furniture Building Easier

A DOWELING jig that will enable the novice to bore perfectly true holes to receive dowels on flat work such as table tops and cedar chests, may be made in half an hour.

Cut two 6-in. pieces of ¾-in. strap iron. Through each drill an accurately centered ⅜-in. hole 2½ in. from one end, and a 5⁄16-in. hole an equal distance from the other end. Then drill and countersink three screw holes in each as shown.

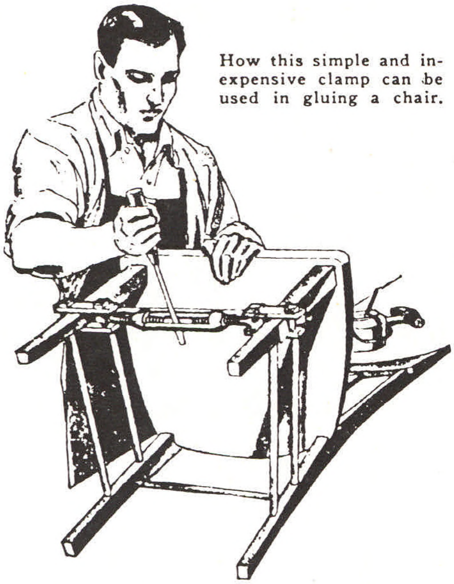
Square up a piece of ¾-in. hardwood stock to 2¼ by 6 in. Gage down the middle of each edge. Locate a point 2½ in. from each end and square around the piece. Then use each point at which the pencil marks cross the gage marks for a center for scribing a small circle with a sharp compass. Clamp the straps firmly to the block, using the circles to center the 5⁄16- and ⅜-in. holes. Fasten the straps on with screws, glue the wood to another piece of hardwood, as shown, and drill out the wood between the holes in the straps.



How to make and use a simple jig to aid in boring holes for dowels accurately

Make a scratch with a small file on the lower strap opposite the center of each hole, so that the jig may be clamped to a board exactly where it is desired to bore. To get a tight fit with factory made dowels, use a steel drill, with lips blunted from a point 2 in. from the end up to the shank.—G. H. Whiteaker.

SPECIAL CLAMPS MADE WITH TURNBUCKLES

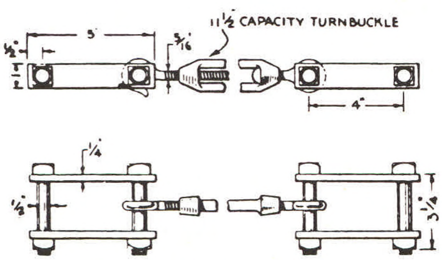


How this simple and inexpensive clamp can be used in gluing a chair.

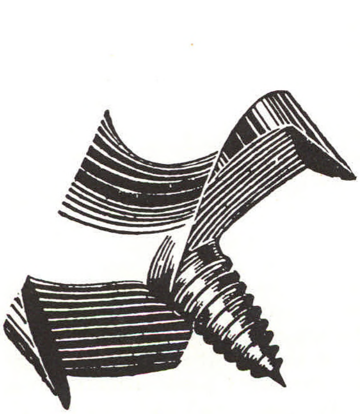
BY MAKING use of turnbuckles, the amateur craftsman can easily improvise clamps for drawing together parts that are of irregular form or that require the use of some device of greater capacity or flexibility than ordinary hand screws.

Each clamp requires only some band iron, four bolts, and a turnbuckle. While the dimensions on the drawing give a clamp of wide utility, the same principle can be used in making clamps of any size.

-PAUL LEO.

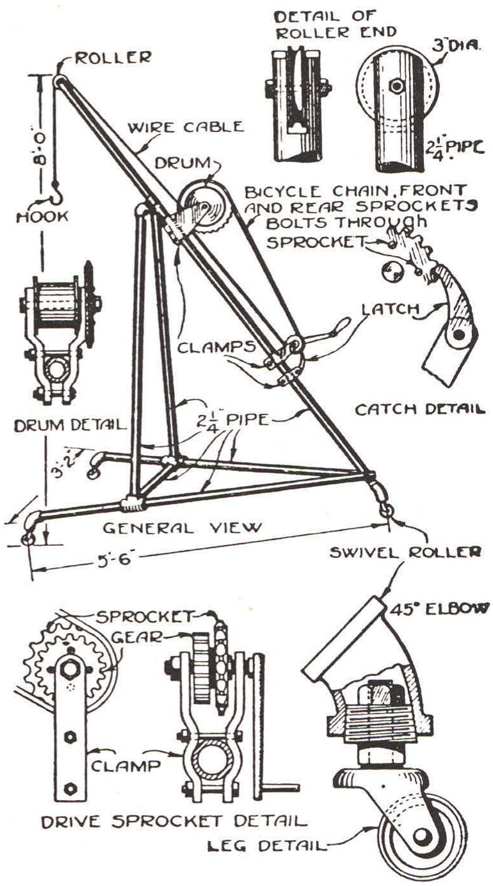


A turnbuckle, four bolts, and some band iron are the only materials needed for each clamp.



A Home-Made Portable Crane for Garages

A PORTABLE crane for a garage is one of the most necessary tools required. It provides a means for lifting motors, gear cases and other heavy parts from automobile chassis. The one illustrated is easily constructed of old iron pipe, bed casters, bicycle

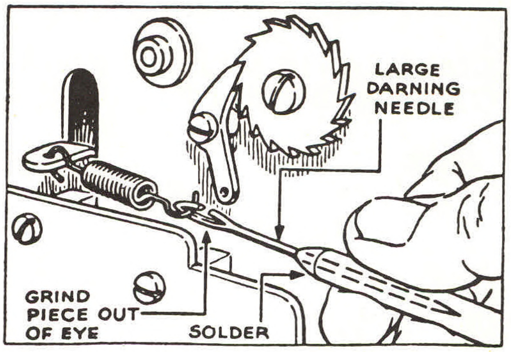


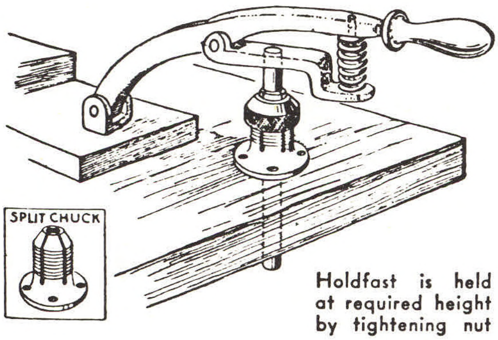
A garage crane made from old iron pipe, bed-casters, and a bicycle chain and sprocket

chain and sprockets and one crank and one gear, several pieces of band iron, a length of steel cable, a wood drum, old sash pulley at the top, nuts, bolts, etc. As this will weigh only 200 lbs. or possibly less, it is readily placed in almost any position and is a great help to all repairmen.

Detachable hooks of different sizes may be used so as to engage different size parts to be lifted. The connecting pipes of the frame are standard fittings bent to fit and drilled for 1/4-in. bolts to give additional strength. The catch is made from a piece of band iron and also its clamp. To release the tension or lower the article, press down on the handle, hold the latch or catch up, and allow the handle to reverse until correct height of article is found; then release the latch, which will hold the gear as before at any desired position.—P. P. AVERY.

Needle Unhooks Springs. This little gadget is very useful when you're working on typewriters and other crowded mechanisms. Trying to unhook (or worse, to hook) small tension springs by hand or with long-nose pliers is often exasperating. The tool at right, which makes the job easy, is merely a darning needle soldered in a tubing handle. One side of the eye is nicked open on a grinder. If you prefer, the needle can also be held by a setscrew meeting a hole in a rod.—*Andrew Vena, Philadelphia.*





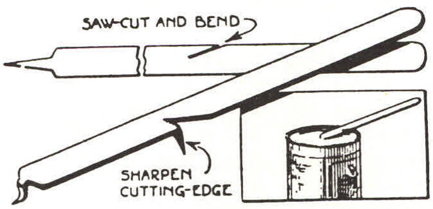
Holdfast is held at required height by tightening nut

Quick-Acting Holdfast Speeds Bench Work

THIS quick-acting bench holdfast is adjustable for height and can be swung in a circle. It is held at the required height by tightening the knurled nut on the split chuck. Once set for a certain job, each piece can be clamped down or released in an instant by using the handle to compress the stiff coil spring.—C. H. W.

Can-Opener Easily Made from Strap Iron

CAN-OPENERS can be made in any desired size by using a straight piece of light-weight strap iron or steel as shown in



This can-opener, made from a piece of strap steel, will be found effective for cans of one size

the drawing. One end is pointed and a cut is made in the piece at an angle. The end and the cut are bent as shown. The cutting edge must be sharpened.

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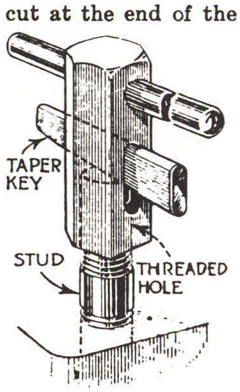
Easily Detached Stud Driver

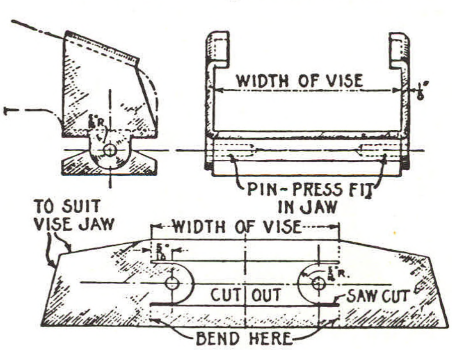
A STUD driver that can be detached easily from the stud after it is driven home, or after the stud has been removed from the hole, is illustrated. It is made of hexagon steel of about the size of the nut. A slot is cut at the end of the tapped hole to take a tapered key, similar to a drift for removing taper shank drills.

With the key in place the driver is turned on the stud and the stud is driven home. Then the key is knocked out so that the driver is free to turn off loosely.—R. W. CADMAN.



Driving a stud

Constructing Swivel Vise Jaws to Hold Tapered Work



THE swivel vise jaw shown in detail above is one that has proved satisfactory for general work. The construction is so simplified that the cost is insignificant compared to the time it saves and the many uses to which it can be put.

This design may be modified to fit a vise of any size or style. The jaws are of steel and are made in pairs.—WALTER LYON, Milwaukee, Wis.

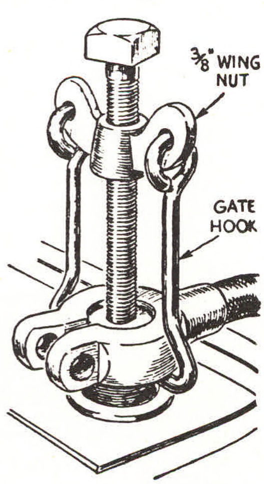
Improvised "spade" removes shingles without splitting

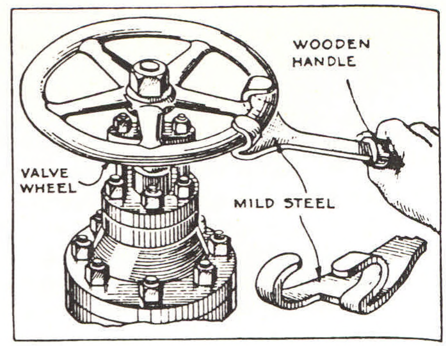
Homemade Tool for Lifting Old Wooden Shingles

TO REMOVE wooden shingles from a roof, various spadelike devices are used, but one can be made by fastening any heavy piece of scrap sheet iron to a handle. Few of the shingles will be split if the tool is handled with reasonable care.—NORVAL WRIGHT.

Homemade Tool Loosens Stubborn Battery Lugs

BATTERY lugs that are stuck tight can be removed with the tool pictured below. Twist two short gate hooks so that the eye and hook ends are at right angles. Suspend these from holes bored through the ears of a ⅜" wing nut. Screw the wing nut onto a bolt with a square head, and set the bolt on top of the battery post with the hooks slipped under the battery-terminal lug. Turning the bolt head with a wrench will loosen and lift the lug, without putting a strain on the seating of the battery post.—A. H. W.



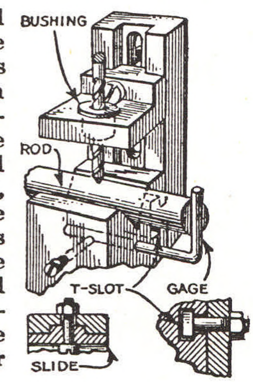


LEVER AIDS IN SEATING HANDWHEEL VALVES

BY USING the simple valve wheel lever illustrated, it is an easy matter to open and close large handwheel valves. The lever, which can be shaped from mild steel, should be supplied with a wooden handle. Such a lever is useful in the operation of a throttle valve.—C. WILLEY.

Adjustable Jig for Drilling Holes in Round Bars

A CHEAP and yet accurate jig for drilling holes in round stock can be made as illustrated. A square block, provided with a V-groove, is fastened to the upright by means of a T-slot. The upright is grooved to allow the bushing bracket to be adjusted up or down.



A ½- or ⅜-in. hole is drilled in the end of the block to receive a bent rod, which acts as a gage. The gage is held in any desired position by a setscrew.

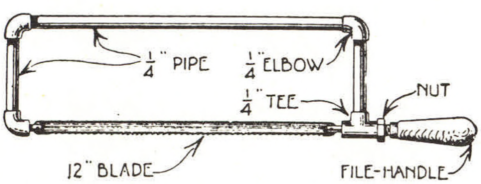
The nail picker at the left will prove a big help on a job where a large number of nails must be used, saving your fingers when you dip the nails out of a keg. Cut the body from soft wood. Drive nails, equally spaced, through the broad end and bend them slightly to assist the clutching action. Handle the picker like a scoop

Making a Hacksaw Frame at Home

IT happened on Monday, July fifth, a holiday in celebration of July Fourth, which fell on Sunday. The previous Saturday we purchased six new hacksaw blades to be fully prepared for cutting all the conduits necessary, as we intended to spend our holiday installing the conduits for the wiring of our house.

Then, accidentally, we broke our hacksaw frame. We tried to borrow one from our neighbors, but no one seemed to have one, so we decided to make one.

Out of some spare ¼-in. gaspipe fittings we took three 90° ells, one tee, a 1/15-in. length of pipe, and two 3-in.



This shows how a serviceable hacksaw frame was made from odd bits of pipe

nipples, the latter three pieces threaded on both ends with right-hand threads.

A 5-in. piece of 5/16-in. round iron rod was pipe-threaded on both ends, one end to a depth of ½ in. and the other end for about 2½ in. This rod we cut into two pieces, one piece 1 in. long having the ½ in. of thread, the other 4 in. long and having the 2½ in. of thread. The unthreaded ends were slotted to a depth of ½ in. and holes drilled with a No. 20 drill, perpendicular to the slot. The 1-in. piece was threaded into the ell, the blade inserted in the slot, and a cotter-pin through the hole and blade, to hold it in place. The threads of the tee on the opposite end were filed out and the 4-in. end was inserted in the tee, the blade fitting in the slot, and another cotter-pin was used to hold that end in place.

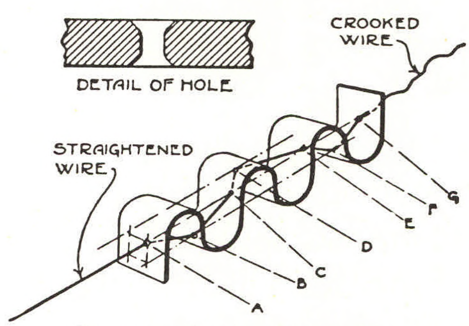
A 5 16-in. nut was then screwed on the other end and a large wooden file handle, drilled out, was threaded on the 4-in. piece.—T. P. FOOTE.

It's Both a Wire Straightener and Tensioner

SMALL copper wire for winding magnet coils should have all the kinks removed from it, and should be held at constant tension while winding, in order to keep the wire in any layer from sinking in between the turns of the preceding layer, thus introducing irregularities in the winding and a consequent waste of winding space.

The device shown in the sketch, made from an 18-in. piece of band-iron ⅛ by 1½ in., will achieve both of these objects. As will be seen, holes *A*, *C*, *E*, and *G* are in line with one another. *B* and *F* are below this line, while *D* is an equal distance to the left of it.

As the wire is drawn through the seven holes, it is straightened in two different planes. This will work out many small kinks that would not be caught by ordinary means in use for the purpose among amateur electrical



You can make that wire straight and tight by using this device

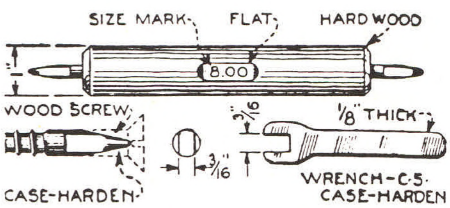
workers. With the added advantage of holding the wire at a practically constant tension, the straightener becomes particularly effective.

The holes should be counter-sunk on both sides, and rounded off with a round file, so as not to tear the insulation on the wire. The holes can be laid out and made while the bar is still flat; but this involves quite a job of drafting, and, unless one is proficient at this kind of work, better results will be obtained by bending the bar to shape, then marking the centers for the holes, and unbending the bar sufficiently to get at the centers with the drill-press.—H. N. KRANER.

Cheaply Made Measuring Points for Large Work

A HANDY measuring rod may be made from a discarded broom handle, or any round, hardwood stock, and two wood screws. The point is turned on each screw by holding in a spring chuck; the flats are milled. The points are then case-hardened.

The points may have a total movement of about 1 in. Holes should be bored in



Two wood screws with case-hardened points are inserted into a hardwood handle

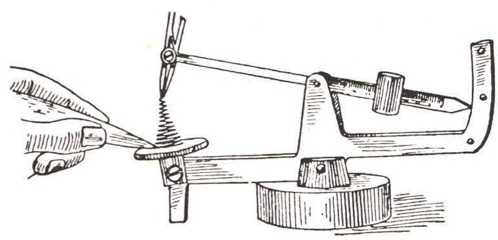
the stick before the screws are turned in and a little soap should be used on the screws.

When set to a micrometer, the points will retain their accuracy for an indefinite period, provided the wood used is well seasoned. If they are to be used frequently, a small wrench made as shown will be more convenient than an adjustable wrench for making adjustments.

WEIGHING THE STRENGTH OF A HAIRSPRING

Measuring the strength of a hairspring, that little flat coil of hair-like wire which controls the to-and-fro revolution of the balance wheel of a watch, is a delicate operation that often taxes the ingenuity of the watchmaker. This simple little scale is designed to make the task as easy as weighing a pound of butter.

At one end of the scale arm is a clip which holds the collet or heart of the hairspring. The outer end of the spring is kept against the inclined disk or anvil by a hand tweezer. The movable weight on the scale beam is then adjusted until the pointer is opposite the zero mark on the curved



Scale for Weighing Strength of Hairspring

indicator to the extreme right. The strength of the spring is then read off on the graduated beam, and may be compared with that of a standard spring.

A Handy Jack

A SIMPLE, quick-acting jack that has many uses around the garage is shown in Fig. 6. The uprights and lever can be made of wooden two-by-fours with one-half- or five-eighths-inch stove bolts for

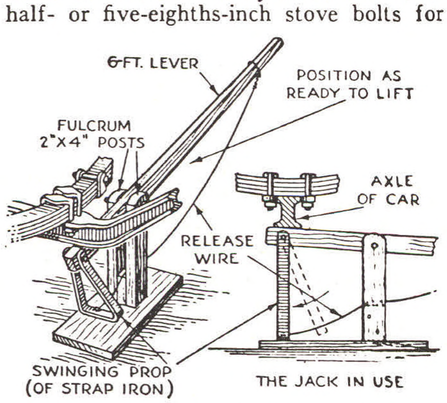
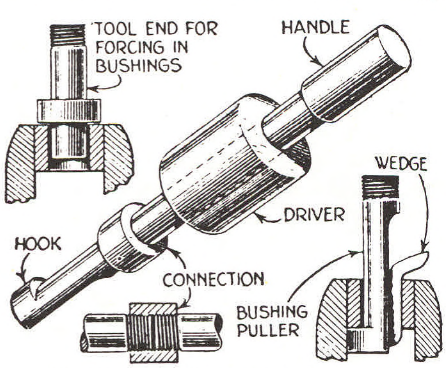


Fig. 6. A homemade jack with strap iron foot and wooden lever finds many uses in garage

hinge pins. When the release wire is pulled back, the strap iron foot swings back and up so that the business end of the lever can be placed under the axle. When the wire is released and the other end of the lever depressed, the axle is raised and the foot automatically swings into place to keep the load in the elevated position. Pressure on the lever, while the release wire is being pulled, allows the axle to be lowered.

Tool for Removing Bushings Has Self-Contained Hammer

THE bushing remover illustrated is its own hammer. When a bushing is to be taken out, the hook is inserted in the hole and caught under the back of the bushing, where it is held by a wedge. The handle then is screwed in place and



This tool with different end pieces serves both for inserting and removing bushings

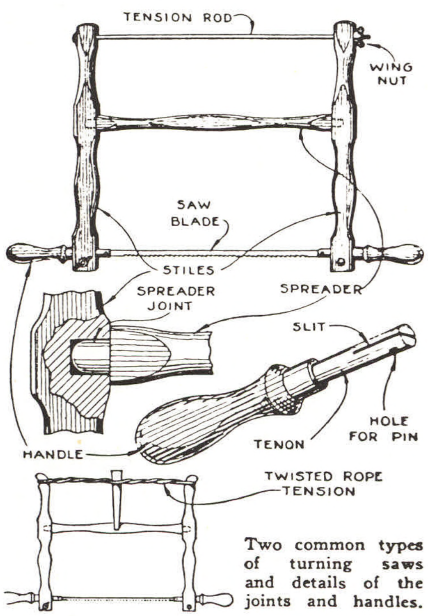
the driver, which is a free sliding fit on the shank of the handle, is worked back and forth like a hammer. The blows ordinarily are heavy enough to pull a small bushing.

For inserting bushings a different type of end piece is made. It has a pilot to enter the hole and a shoulder to force the bushing into the frame.—G. A. Luers.

The Turning Saw—So Old It's Now a Novelty

FOR cutting curves and irregular shapes by hand in wood, there is one inexpensive old saw which has many special advantages, yet relatively few home workers are familiar with it or own one. It is the turning saw (sometimes called a web or bow saw). In shape it resembles the bucksaw, but it has the advantage of a narrow blade which can be set at any angle to the frame. The turning saw serves effectively where it is impossible to use either the hand, compass, or fret saw.

The blade on a turning saw is not resharpened but is replaced by a new one when it becomes too dull for use. The



Two common types of turning saws and details of the joints and handles.

blades, however, are exceedingly hard and will give many hours of use.

The size of a turning saw is determined by the length of its blade, the common sizes being 14, 18, 20, and 24 in. The range of price is generally from $1.50 to $2.50 for the frame and one blade. The blades are sold in $\frac{3}{16}$- and ½-in. widths and can be obtained for from about $5 to $10 a dozen, depending on the length desired.

As a general rule the blade is inserted in the frame with the teeth pointing away from the operator, so that the saw cuts on the push stroke. In using the saw, clamp the work edge up in a vise, hold the saw in one hand, bracing it with the other, if necessary, and use slow, long, easy strokes, always keeping the saw blade at right angles to the surface of the work. In making sharp turns, run the blade up and down in the same place for a few strokes and at the same time turn the saw slowly until the proper direction is obtained. Avoid quick turns, as they tend to bend the blade and will often break it.

For those who wish to make their own turning saw frame, the use of either birch, maple, or ash is suggested for the stiles (sidepieces), spreader, and handles. For a saw having a 14-in. blade the end stiles may be 12 in. long, 1½ in. wide at the bottom tapering to ⅝ in. at the top, and ¾ in. thick. The blade is attached to the wide end. The spreader bar, ¾ in. square, which acts as a pivot for the end stiles, is fitted to these stiles with mortise and tenon joints and is located 8 in. above the saw blade. In the best construction, the tenons are short stubs and are rounded on the ends to allow a slight pivoting action, and, of course, are not glued.

The tension rod, which pulls the smaller ends of the stiles together and thus supplies the necessary tension to the blade, can be a long bolt or it may be made from a piece of steel rod threaded to receive wing nuts at both ends.

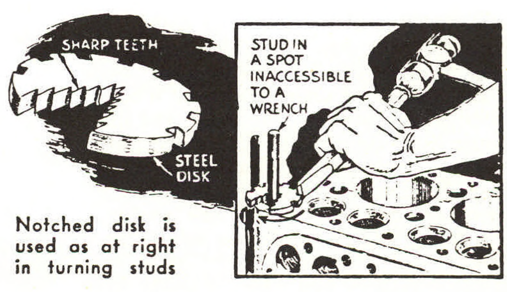
In making the handles, stock must be allowed for the round tenons which fit into holes at the lower end of each stile. A saw cut is placed at the end of each tenon and a small hole is bored perpendicularly to this slot and ½ in. from the end. These slots and holes take the saw blades and pins respectively.

The stiles are slotted in the direction of the saw for a distance of 1 in. above the handle holes. Holes are bored at right angles to the slots, and bolts to take wing nuts are passed through. These slots and wing nuts serve to regulate the friction on the handles.

Some turning saws are supplied with a twist cord and stick instead of the steel tension rod and wing nuts. With this method the tension is applied to the blade by twisting the cord and locking it in position by means of the twist stick, which is placed so as to bear against the spreader bar.—S. S. PARKINSON.

Homemade Tool Turns Hard-To-Reach Studs

STUDS on a motor block that are hard to get at with a wrench can be turned easily with a handy tool made from a steel disk. Cut a V-shape notch out of the disk, give its edges sharp notches, and file a few square slots in the disk rim. The tool is seen in use at right.—A. H. W.



Notched disk is used as at right in turning studs

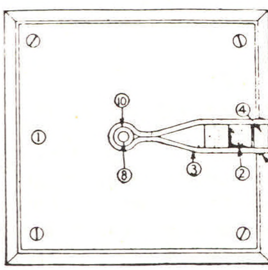
Simple Laying-Out Tool Aids the Home Machinist

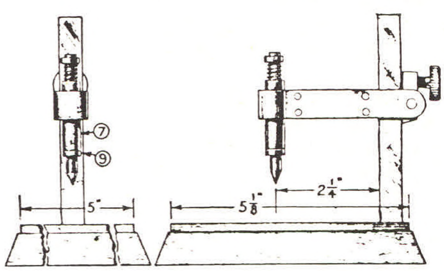
By Howard Greene

FOR home machinists and others who do accurate mechanical work, the little tool illustrated is an aid in doing good work in the quickest and easiest way. It consists of a center punch, or prick punch, mounted in an adjustable arm that projects over a table.

The punch works in a guide and normally is held up by a light helical spring. In use, the point of the punch is brought as close as possible to the work by adjusting the arm, and the punch is struck a light blow with a small hammer, after which it automatically returns to its position just clear of the work. The dimensions given are those of a machine that has been used for many years with satisfaction; but it is obvious that they can be varied in many ways.

The base or table (1) is of 3/16- or 1/4-in. cold rolled steel 5 by 5 1/8 in., and





Top, side, and condensed front views of the laying-out machine. The punch is adjusted as closely as possible in relation to the work and then struck lightly, thus insuring an accurate mark

the post (2) of 1/2-in. square cold-rolled steel 4 1/2 in. high above the table, is set into it, clearing the back edge by 1/8 in. One end of the post is shouldered down, preferably but not necessarily in the lathe, to 3/8 in. and fitted tightly into a hole drilled in the plate. The hole is countersunk at the bottom and the end of the post is riveted and then filed off flush. The main thing is to see that the post is set solidly and stands perfectly square. The plate is screwed to a 3/4-in. hardwood base.

The arm (3) is made of 1/8 by 5/8 in. cold-rolled steel, which is bent around a brass tube and riveted as shown, so that the tube is clamped hard and fast. The bending is best done hot. The steel is spread toward the back and a brass block riveted in to bear against the post. Make a close fit against the sides of the post. The ends are carried back to form lugs between which is pivoted the clamping block (4), which is of cold-rolled steel 3/8 by 1/2 in. and 1 1/4 in. long.

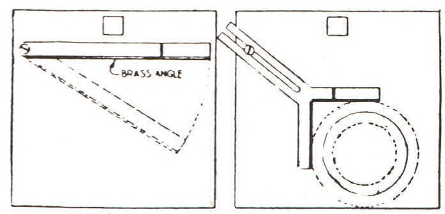
The pivot (5) is a piece of 1/4-in. steel rod, with the ends riveted over after assembly. The clamping screw (6) is 1/4 in., preferably with a thread of fine pitch.

The brass tube (7), through which the punch plays, should be of the heavy-walled kind; it should have walls at least 1/8 in. thick. The exact diameter is not important, nor is that of the punch itself. The punch (8), however, should slide freely but with no shake.

A brass collar (9), pinned on below the tube, limits the upward movement of the punch, and a similar collar (10) near the top takes the spring pressure. Drill the holes for the collars before hardening the punch. Give the punch point a long, sharp taper and see that the point is exactly in the center.

Using this tool is like having a third hand; the workman has his hands free to hold the work and wield the hammer, which, by the way, should be light, as the tool is not intended for heavy work.

For straight work, it often is convenient to use a guide. This is clamped to the plate by a screw that allows it to be



Brass angle used as straight guide, and an angular guide for setting cylindrical work

swung around, bringing it to within any desired distance of the center.

If it is desired to make a row of marks all the same distance from the edge of a plate, set the guide so that it comes to within that distance from the center of the table, clamp it, and then the work can be slid along and punched at the desired intervals. The easiest way to set the guide is to set a pair of dividers to the distance the holes are to be from the edge, scribe a little arc on the table from the center, and swing the guide until it is just touching and tangent to the arc.

The center of the table is marked by bringing the arm down and marking with the punch.

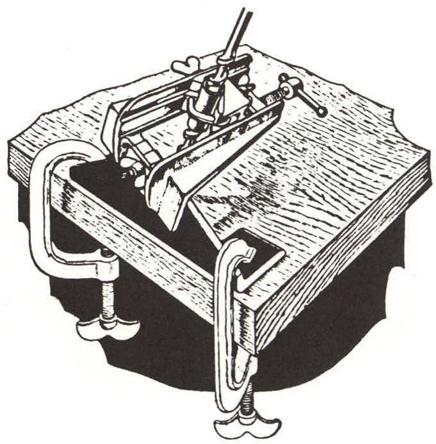
Round work can be handled conveniently with the aid of an angle guide. If a cylindrical piece is put into the angle guide, and the guide set so that the point of the punch will come over a point, say 3/8 in. from the outside, then by turning the piece in the guide a ring of marks can be made all exactly the same distance from the outside, and perfectly concentric with it. This is often of great value.

For a job that stands high the arm can be raised, and *vice versa*. If one is likely to have high jobs, the post can be made longer at the outset. Work of irregular shape can be put into a drill-vise, or clamped between the jaws of a machinist's clamp.

By holding the punch down with one hand and moving the work with the other, the tool can be used for scribing. In fact, there are a hundred and one things that can be done and any one who makes the tool will think of plenty of them. The more this simple laying-out tool is used, the more ways will be discovered in which it can be used.

Adjustable Jig for Boring Holes at Any Angle

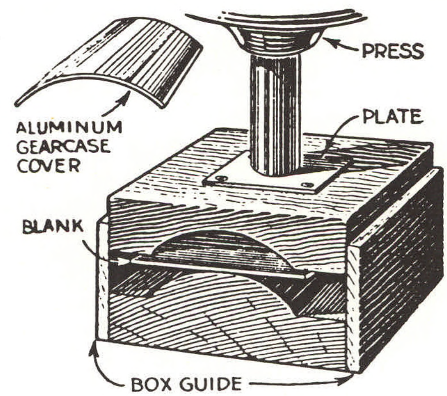
HOLES may be bored accurately at an angle in wood by mounting a doweling jig of the type illustrated on a bracket cut from a piece of angle iron. Both the jig and the angle iron are drilled for a ¼" bolt. The jig pivots on the bolt and is held at the required angle by a wing nut. The whole device is fastened to the work with clamps if possible; or the ends of the angle iron may be drilled for screws.



Wooden Forming Dies Serve for Experimental Work

FORMING dies of hard wood often are useful on experimental work, or where only a few pieces are to be made. The illustration gives the general idea of their construction.

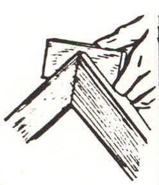
In this case several aluminum gearcase covers were wanted, so top and bottom

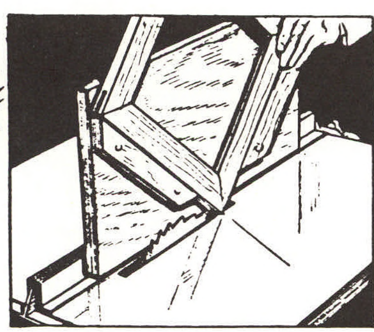


A simple way to make forming dies of wood for shaping a few pieces of light sheet metal

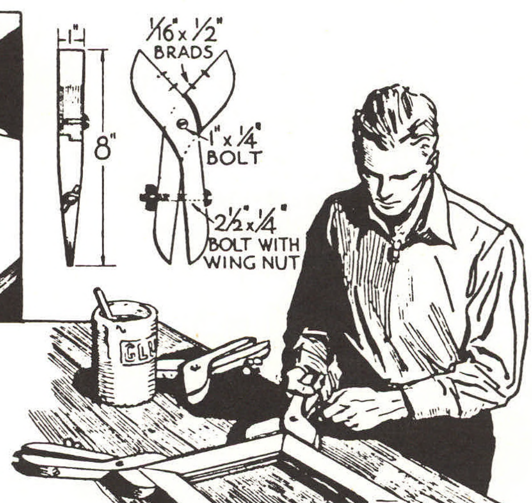
dies were made of maple and the forming was done in an arbor press. The blocks of wood were sawed to the required shape and boards were nailed to the sides of the lower one to form guides. If the die is to be used several times, a steel plate can be put on top to receive the pressure of the arbor-press ram.

Forming dies of this kind can be used successfully on sheet steel up to about 1/16 in.—H. L. W.





Use a jig to cut the slot in the frame for the spline



Special Clamps Squeeze Picture-Frame Joints

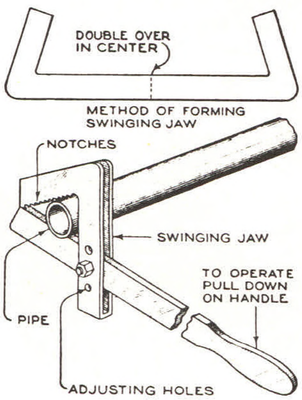
PICTURE frames can be glued together with wooden jaws or clamps resembling large pliers. They are made as illustrated to the right above. The two wooden parts are shaped from pieces 1" by 8", and a 2½" by ¼" bolt is inserted through the handle so that the wing nut can be tightened to keep the pliers firmly in place.

After the glue dries, cut a saw slot in each corner for thin wooden splines or reënforcing pieces. To aid in doing this, a jig should be used as shown. It is merely a board with two strips screwed on at right angles to each other.

Cut the splines from 12" to 24" in length and thick enough to fit snugly in the slots, then cut them to the length wanted. Glue them in the corners, let them dry, and trim them off flush so that the frame can be finished.—RUDOLPH KNAUS, SR.

A Homemade Pipe Wrench

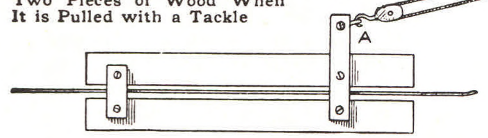
A homemade pipe wrench that has some advantages over the purchased article is shown in the drawing. The upper jaw is free to swing and is provided with holes for adjustment, although a wide range of pipe sizes can be accommodated in each position of the jaw. With the exception of the bolt all parts are made from flat steel. The jaw is made by bending over the ends, as shown, and then bending at the center; notches are filed in the underside, and if possible, this part of the wrench is hardened to minimize wear.—R. H. Kasper, Philadelphia, Pennsylvania.



An Electric-Wire Gripper

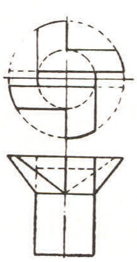
The gripper is a simple device and can be easily constructed as shown in the sketch. Two pieces of oak, 10 in. long, 1 in. wide and ¾ in. thick, are linked together with four pieces of metal, two of them 4 in. long, and two, 6 in. long; all being ½ in. wide and ¼ in. thick. Large screws or bolts are used to connect the parts. A bolt is run through the ends of the two long pieces of metal at A. The tackle is connected to this bolt and the end of the wire placed between the pieces of wood. As the tackle pulls on the device, it grips the wire tightly without danger of damaging the insulation on the wire.—Contributed by Jas. E. Noble, London Junction, Ont.

The Wire is Tightly Gripped between Two Pieces of Wood When It is Pulled with a Tackle



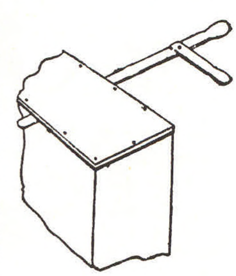
Screw Head Used for a Countersink

A countersink will not cut the wood on a bevel to fit the various screw heads as the different sizes do not have the same bevel on the under side of the heads. Where the screw head is wanted to be flush with the wood and a neat fit is desired, make a temporary countersink from one of the screws. This is done by cutting the screw in two above the threads and filing the head, as shown in the illustration, to make a cutting edge. Use a brace and a screwdriver bit to turn the screw cutter in countersinking the holes. Turn the cutter down until the head is flush and it will make the exact bevel, cutting a perfect and smooth hole.—Contributed by C. L. Wall, Lawrence, Kansas.



A NOVEL BOX-OPENER

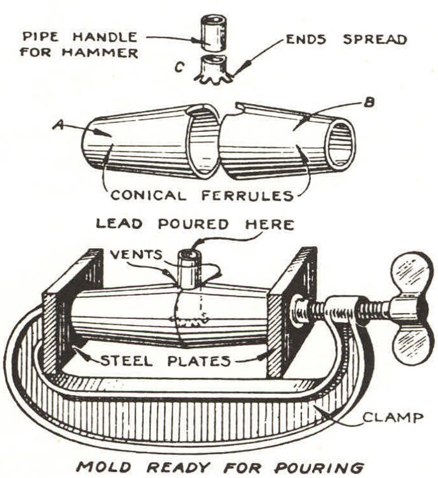
A handy box-opener which can be used also for many other purposes is the invention of an Iowa man. The device consists of a long, flat metal blade of gradually increasing thickness from its front to its rear end, the latter extremity being the handle. Pivoted adjacent to the handle is a lever, which swings in the plane of the flat surface of the blade. In operation the blade is forced beneath the box lid, and with the aid of the lever the operator is enabled to pry off the lid with a minimum amount of effort. When not in use the lever can be swung around to register and conform with the outline of handle, the implement when so arranged occupying but little space.



EASILY MADE MOLD FOR LEAD HAMMERS

TO MOLD lead hammers for garage or machine shop use and to remodel old hammers when they get battered out of shape requires only a few minutes' work when the method illustrated below is used.

Two open-end and slightly conical ferrules are made from a piece of old fender or other scrap stock as at *A* and *B*, the seams being welded. A semicircle is cut in the large end of each ferrule as indicated so that they will come together edge to edge around a suitable short piece of pipe *C*, which serves as the hammer handle; however, where the semicircles



The mold consists of two slightly conical ferrules clamped around the hammer handle

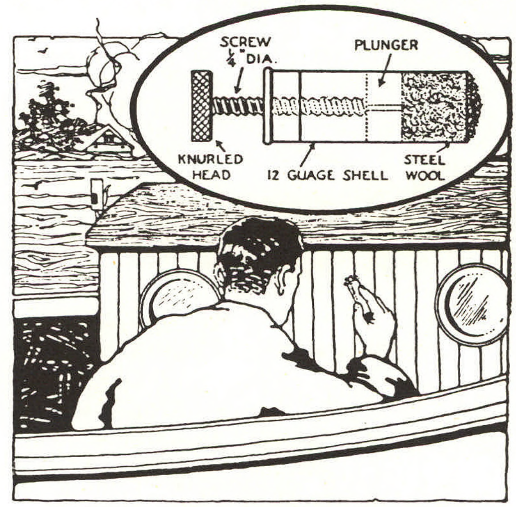
are cut out for the pipe the fit should be loose enough to allow the excess lead to escape during the casting process and thus avoid filling the hollow handle.

One end of the pipe handle *C* is split with a saw, and the tabs are bent out. Then the mold is clamped together, with steel plates to close the ends of the ferrules, and the lead, which can be salvaged from old batteries, is poured in through the pipe handle.

If the ferrules are reasonably smooth on the inside, they can be slipped off easily when the lead cools.—W. J. FINK.

Holder for Steel Wool to Protect the Hands

ONE of the objections to using steel wool for cleaning kitchen utensils, such as the bottoms of saucepans, is that particles of the wool are liable to become imbedded in the fingers; but if it is enclosed in a fairly stiff cardboard



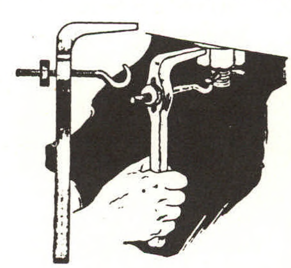
The wool is enclosed in a case so that it will not injure the hands

tube, not only will this objection be overcome but a great saving of the wool will result.

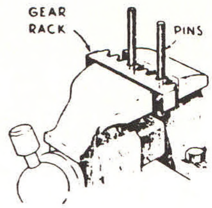
An empty 12-gage shell may be used and filled tight with the wool. This will be found to be a great improvement over holding the wool in the bare hands. The cap and anvil should be driven out from the head of the shell and tapped for a ¼-in. screw with a knurled head. The opposite end of the screw is then fitted with a plunger so that the wool may be pushed out as it is used or rubbed away. A larger tube with a wood end carrying a screw and plunger could be used to advantage.

Strong Cotter-Pin Puller

EVEN large and stubborn cotter keys cannot resist the persuasion of the unusually powerful puller illustrated. It should be made from a good grade of tool steel. The lever is bent as indicated, and a slot is made in it through which the adjustable screw hook is inserted. In use, the hook is entered in the eye of the cotter and the thumb nut screwed up until suitable leverage may be obtained. As the cotter is pulled, the nut is screwed up more to give better leverage.—CHARLES H. WILLEY.



BENDING JIG FOR VISE

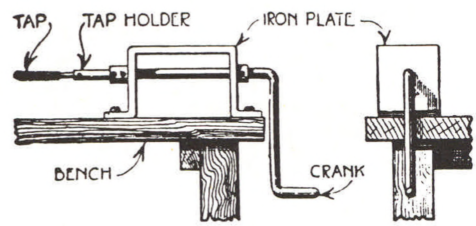


For bending and shaping large wire or the smaller sizes of metal rods or bars, an improvised bending jig like that shown is useful. It consists of a portion of an old gear rack and two or more bolts or steel pins. The rack is placed along one jaw of the vise, and the pins are clamped between the teeth at the desired distance apart.—W. C. Wilhite.

Make a Tapping-Machine at Home

YOU don't have to purchase a high-priced tapping-machine if you adopt the idea shown in the accompanying sketch.

Rig up on a bench a piece of iron of the shape shown, place through this a shaft with a handle and you have a tapping-machine. The square end of the tap fits into a square hole of the



If you have much tapping to do, you will find this little machine a great help

tap-holder sleeve. With this machine you can tap all sorts of work at very little cost. The sleeve that holds the tap is removable, so that different sized ends to suit different sized taps can be used.

This simple machine means added production wherever holes have to be tapped, and, what is more important, it means fewer broken taps.

TAPS AND DIES MADE FROM MACHINE SCREWS

It often happens that it is difficult to obtain taps and dies for machine screws, so that when one has an extra machine screw or nut, especially if it is of an odd size and pitch, it pays to make it into a tap or die by the following simple method:

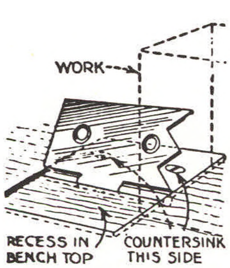
File the screw square and taper the point slightly. Bring it to a red heat, and caseharden by rubbing it in cyanide of potash, heating again, and plunging into cold water.

Dies are made from nuts by filing to give clearance for chips, and case-hardening in the same way.

Taps and dies made in this way are very serviceable, as they are glass-hard on the outside and soft and tough on the inside. They will stand very rough usage without breaking, and their cost is practically nothing.—Contributed by A. D. Whipple, Oakland, Cal.

Hinge Used in Novel Way to Form Bench Stop

WHILE the use of a butt hinge to serve as a bench stop is familiar to many woodworkers, the method of setting the hinge shown is novel. In this case the board to be planed is pressed against the end of one leaf of the hinge.

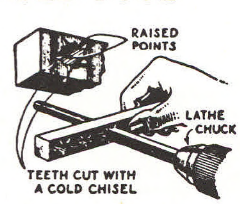


Folding bench stop made from butt hinge

A recess is cut in the bench top so that the flat side of the hinge will be flush with the top. One leaf then is fastened with large wood screws and the other is notched to engage work pushed against it. When not in use the stop is folded over into the recess, leaving the bench top unobstructed.—Philippe A. Judd.

WOODEN DOWELS TURNED WITH SIMPLE TOOL

DOWELS can be quickly turned from wood with the tool illustrated. It should preferably be made of steel, but iron or even hard brass will do for temporary purposes. The hole in each case should be slightly larger than the bit

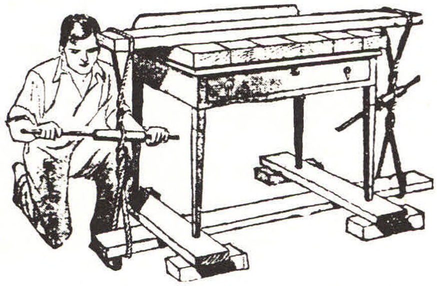


A homemade tool for turning small dowels

to be used for boring the dowel holes. After the hole has been drilled in the tool, cut the teeth with a cold chisel and then pass the drill through from the opposite side to remove the bur. If this is not done, the dowel will be too small. A piece of wood of nearly the required size, either square or round, is held in the chuck of the lathe, and while it is in motion, the tool is pressed firmly and steadily on the wood. It is well to make a tool with several holes graduated in size so the dowels can be worked down.—James H. Beebee.

ROPE CLAMP FOR GLUING VENEERED FURNITURE

IN REGLUING veneer over the entire laminated top of a desk, the writer found it impracticable to take the piece apart, yet there were no clamps available large enough for the work. The problem was solved by the old turnbuckle princi-



Regluing the veneered top of a valuable desk with ropes twisted like turnbuckles.

ple applied as illustrated. A short length of pipe was inserted between the ropes at each end for the purpose of allowing the twisting rod to be shifted back and forth as necessary to clear the desk legs; and when sufficient pressure had to be obtained, the rod was slipped through the pipe far enough to hold against the legs and prevent untwisting. No lower cribbing is needed for a job of this kind if it is possible to insert ringbolts in the floor.

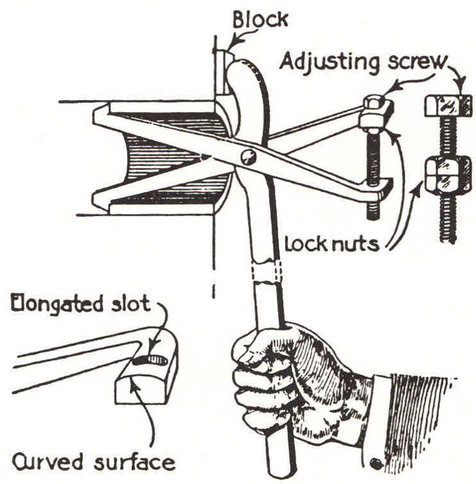
Many pieces of blistered and warped veneering on large pieces of furniture can be repaired in this manner when more pressure is needed than can be ordinarily applied by piling on weights. To insure ample pressure at the center of the top surface, the plank which runs across should preferably be slightly bowed and should be placed with the convex face down.—L. W. HENDERSON.

Percolator Serves as a Gluepot

A DISCARDED electric coffee percolator can be used as an electric gluepot. Place the inner part of an ordinary gluepot in the open top of the percolator to hold the glue. The water heats it quickly.

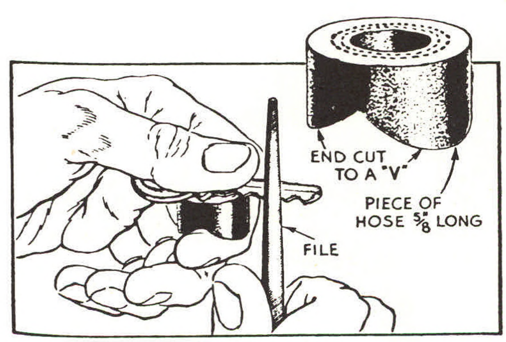
A Home-Made Tool for Removing Different Sized Bushings

THE following home-made device is adjustable to a number of different sized bushings. It is quite simple to make and easy to use. The drawings show its construction and operation. The arms are made of machine steel and the lever of mild steel. The



An adjustable pair of tongs for pulling bushings from their housings by hand

legs are adjusted by a cap screw, a long hole being cut in the upper end and the top surface curved so that the parts work freely.—CHARLES H. WILLEY.

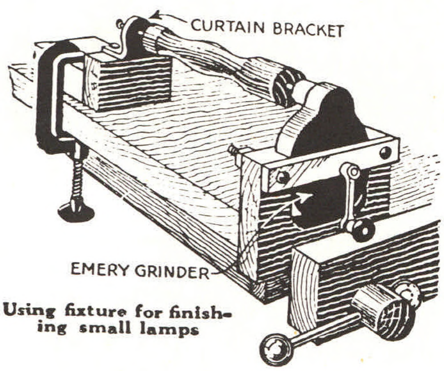


Short Section of Hose Used as Finger Vise

MANY small flat pieces that have to be shaped or finished by filing can be most conveniently held in the fingers with the aid of a section of air hose or heavy water hose about ⅝" long. Cut a V into one end of the tubing to fit over the tip of the forefinger, as shown above.—F. B.

Tool Grinder Provides Power for Sandpapering Machine

FOR finishing and polishing round pieces of wood, such as boudoir lamp bases and shafts, a sandpapering machine can quickly be rigged up with the aid of an ordinary tool grinder. The grinder is clamped in a wooden holder by means of a strip of wood and two bolts, as shown, and this holder is held in the vise. The spindle, from which the emery wheel is removed, forms the live center. A dead center is made with an L-shaped block of wood and

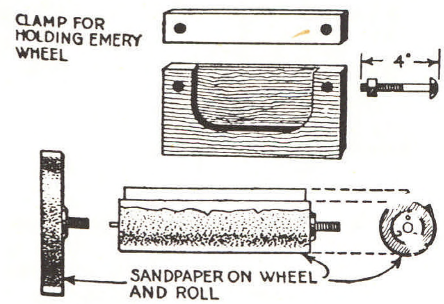


Using fixture for finishing small lamps

a windowshade bracket, the whole being clamped to the bench with a C-clamp.

Small turned pieces can be sandpapered, finished, and polished by using the device as a lathe. In addition, a circular disk about 6 in. in diameter can be covered with sandpaper and attached to the live center to serve as a disk sander. In the same way a drum can be used between centers.

This fixture was used in making several electric reading lamps from old table legs. When cut to the right size and the old varnish removed, each shaft was mounted in the machine and stained. Then a French polish was applied. This was done by making a pad of soft cloth, free from lint and dipping the inside center of the cloth in shellac. Another piece of cloth was placed over it and twisted, so that by twisting the outside piece a little harder from time to time, the shellac on the inner pad was squeezed out. The pad was dipped in linseed oil occasionally to prevent it from sticking. The machine was first speeded up and then the pad was applied until the wood would absorb no more

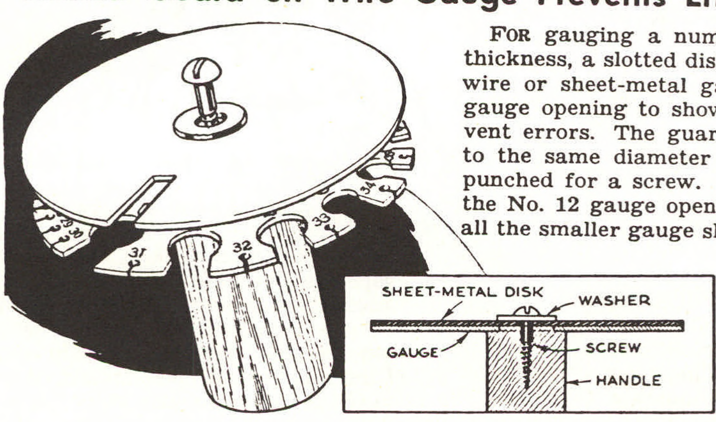


Details of emery wheel clamp and sanders

shellac. After one coat had thoroughly dried (in twelve hours or more), the operation was repeated until at least three coats had been applied.

The bases were cut on a scroll saw and then attached to the live center by means of a screw, and sandpapered. In this way they were made almost as true as if they had been turned in a lathe. The completed product looked like a lamp bought in the stores.—GLADSTONE CALIFF.

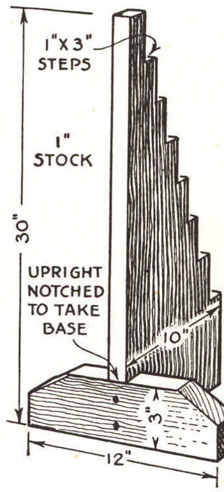
Slotted Guard on Wire Gauge Prevents Errors in Measuring



FOR gauging a number of parts of the same thickness, a slotted disk mounted over a standard wire or sheet-metal gauge will permit only one gauge opening to show at a time, and thus prevent errors. The guard is cut from sheet metal to the same diameter as the gauge and center-punched for a screw. A slot slightly wider than the No. 12 gauge opening will serve for this and all the smaller gauge slots. As shown, both gauge and guard are screwed to a piece of broomstick for ease of handling. A larger slot can be cut opposite the first for gauge openings Nos. 0 to 11.—RONALD EYRICH.

Support for Long Boards Being Planed by Hand

AMONG the various supports used for holding the end of long boards while being planed at the bench, one of the simplest and most convenient is that illustrated. A series of steps are cut out of the upright piece to permit wide work to be held level at different heights. The dimensions given can be altered to suit individual needs.



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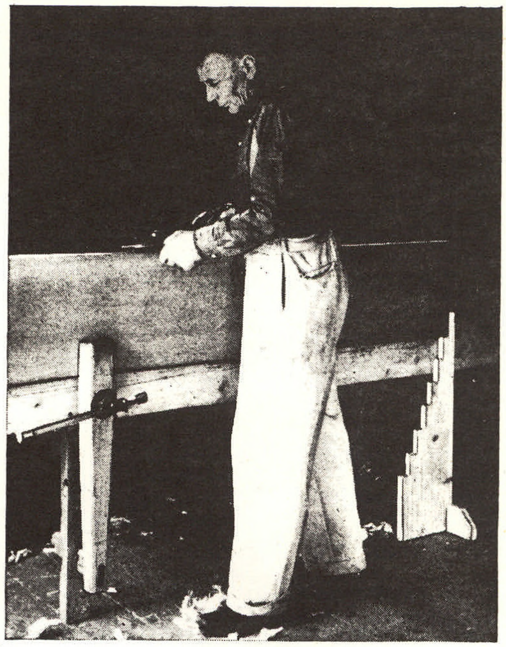
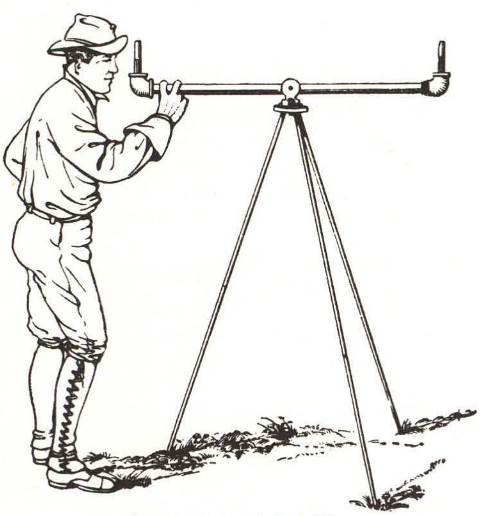
WHEN using a stepladder for repair work, tools and materials may be placed on the top step if strips of ¾" by 1" wood are nailed or screwed around the edge to form a tray. The strips will not prevent stepping on the top step when necessary.



Steps cut in the upright piece allow wide work to be held level at different heights

A Home-Made Surveying Level

A good practical level for use in surveying the ground when laying drain tile can be made from a piece of ½-in. gas pipe and two ells, each fitted with a piece of water gauge glass. The pipe should be about 4 ft. long, to the middle of which is attached a socket



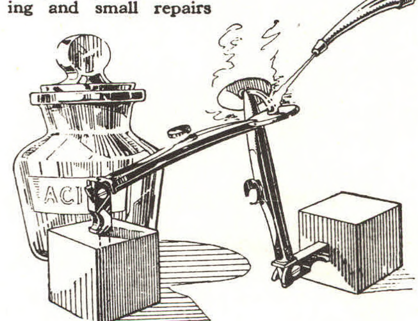
Level Made of Gas Pipe

for the tripod or support. When the level is set up the pipe is filled with water so the water level will be about one-half way in each glass. The surveying is done by sighting over the two water surfaces.—Contributed by Thos. L. Parker, Olaf, Iowa.

Adjustable Vise Holds Small Articles while Being Soldered

THE jewelry repairman and, in fact, any one who has had occasion to solder small articles, will welcome a method that does away with the usual bent pins and charcoal block. Having a great deal of repair work to do, I con-

For jewelry, model making and small repairs



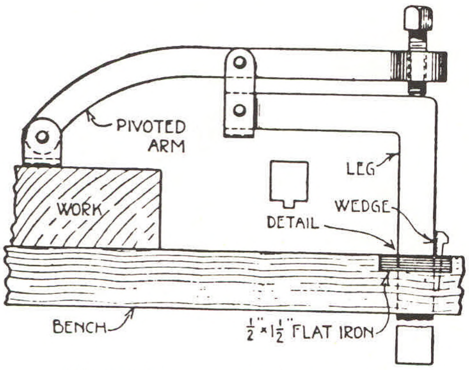
structed several of the clamps illustrated from old hinged ruling pens.

The base is a cube of nickel steel. A hole is drilled in the center of one of its faces to take the shank of the pen. The parts to be soldered are clamped between the points of the pens, which may be placed in various positions. Ruling pens of this old pattern usually may be purchased cheaply secondhand, if none can be found in the junk box or obtained from a drafting-room. — PHILIPPE A. JUDD, Portsmouth, Ohio.

A Bench-Clamp for the Amateur Carpenter

THE bench-clamp is a simple tool to make, yet it is a very excellent device. It is made from odd bar stock; the old square axle of a light buggy furnishes excellent material.

The leg is bent at right angles. The section passing through the bench is 2 ft. long, and the section to which the U-piece is riveted is 10 in. The U-shaped piece is made of ½ by 1-in. iron.

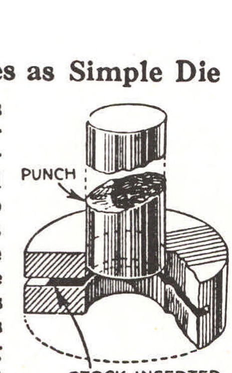


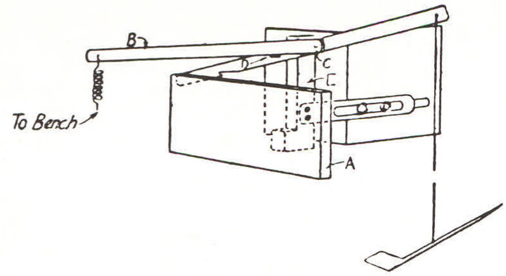
If you have an old buggy-axle lying around, you can turn it into a useful bench-clamp

The pivoted arm is forged from a piece of the axle into the shape shown. The strip of iron set into the plank on the bench is a piece of ½- by 1½-in. iron obtained from an old heavy wagon wheel tire. This strip is fitted up to take the clamp at various parts of the bench. The square holes are made by drilling a hole, filing it square, and then filing a key-way for the taper-wedge key. By prying up the key, the clamp is quickly adjusted for any height and by a light blow upon the key, it is secured.—C. H. WILLEY.

Bushing Serves as Simple Die

THE experiments of a home worker called for a number of small sheet-metal disks and, as no punch press was available, a simple hand punch and die were made, as shown. The die is merely a bushing with a saw slot in which the stock is placed. The punch is driven through by a mallet blow.—R. H. KASPER, Philadelphia, Pa.





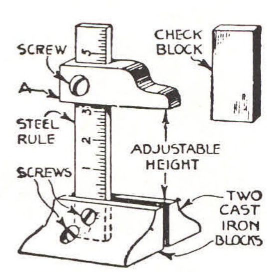
Construction of a bench shear for cutting copper strips. This device is easily operated by a foot treadle

Making a Bench Shear

THE illustration shows a shear that was made for cutting strips of copper, ½ in. wide and ⅙ in. thick. The jaw *A*, is made deep to be gripped in the wire at the bench. The moving jaw is connected to a treadle on the floor. The rod *B*, which brings the moving jaw back to place, pivots at *C*, and rests on the pin *D*. It is worked by a spring which is fastened to the top of the bench. The guide *E*, which is fastened to the stationary jaw, keeps the two cutting edges of the jaws together. The stop is made adjustable, as shown. The jaws should be made from tool-steel. The writer made the stationary jaw out of cast-iron, which has cut several hundred pieces and is still in good condition.—C. ANDERSON.

Bench Height or Sizing Gage Serves Many Purposes

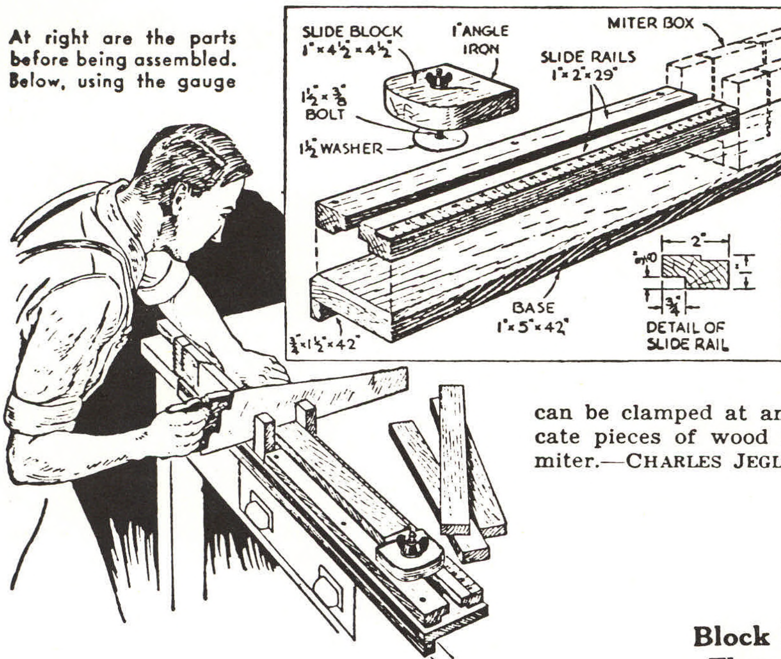
A SIMPLE and effective sizing gage is shown in the illustration. It consists of two cast iron blocks between which goes a regular scale, or, if preferred, a piece of steel marked off to serve as a scale. It will be noted that the scale is fastened to the two blocks by two flat head screws. A sizing member *A* is held by a small screw at any position.



This type of height gage is particularly useful where numerous pieces have to be inspected as to height and width. In order to make sure no inaccuracy takes place during use, commercial gages can be used, or check blocks of the common heights can be made. This latter expedient, however, is only for very particular work.—J. M.

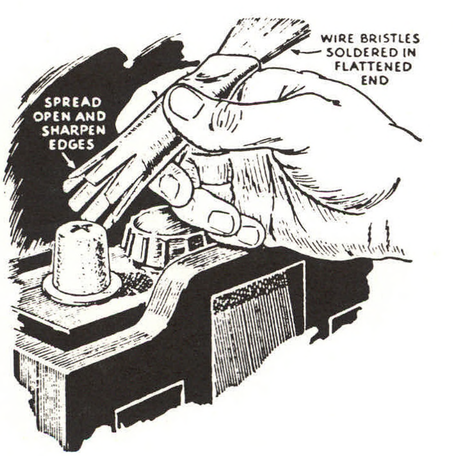
Adjustable Length Gauge for Use with Miter Box

At right are the parts before being assembled. Below, using the gauge



FOR cutting uniform lengths of wood by hand, this sliding gauge is used with an ordinary miter box, which is screwed to one end of the long baseboard. The two slide rails, one of which has a yardstick attached to it, are then screwed in place and the adjustable slide block is made. Note that the slide block can be clamped at an angle in case duplicate pieces of wood have to be cut on a miter.—CHARLES JEGLINSKI.

Homemade Battery Tool Keeps Terminals Clean

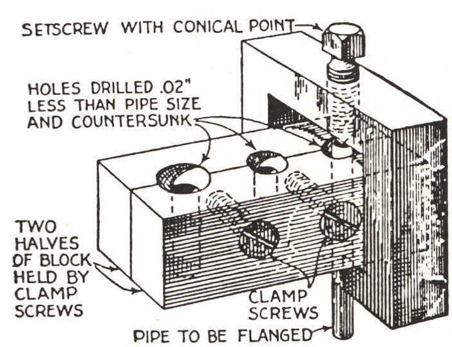


TO MAKE a handy car-battery tool, flatten out one end of a piece of metal pipe or tubing, and solder in a number of short, stiff wires. Then saw the other end of the pipe into sections, as shown in the illustration above. Spread the sections outward with a taper plug to the dimensions of the battery posts on your car, and file the section edges sharp. This end of the tool can then be used to scrape corrosion from the posts, while the other is employed to brush it away, and for other general battery-cleaning purposes.—C.H.W.

Block Fixture for Forming Flanges on Copper Pipes

SUCCESS in making gasoline and oil line connections that will not leak depends mainly upon the flanging of the copper pipe. A shallow or an uneven flange is difficult to draw up firmly enough to prevent leakage, and there is danger of stripping the thread from the coupling in an effort to tighten the joint. 217

A fixture made as illustrated will flange the pipe to form a perfect seat and yet save considerable time over methods that involve the use of a hand flaring tool or



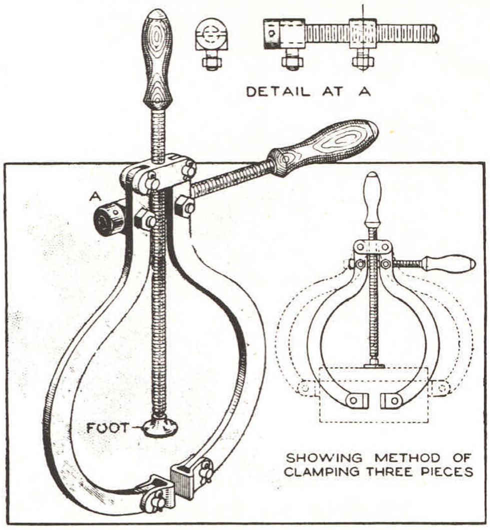
Conical point on setscrew flares pipe for making gasoline and oil line connections

punch and hammer. The device consists primarily of a block in which holes have been drilled of diameters slightly less than the stock sizes of pipe. These holes are countersunk and the block is cut in two after other holes are drilled and tapped for screws to hold the sections together.

A block shaped like a square C clamp is made to fit over these parts. A ½-in. setscrew is fitted into the clamp, as shown, and the end of it is ground to a conical point. It is then only necessary to place the pipe in the fixture and screw down the setscrew. The pipe will not split unless it is hard, under which circumstances it should be annealed by heating and quenching in water.—L. D. J.

Three-Way Hand Clamp Has Many Uses

Where three pieces of material must be clamped together at the ends, as is

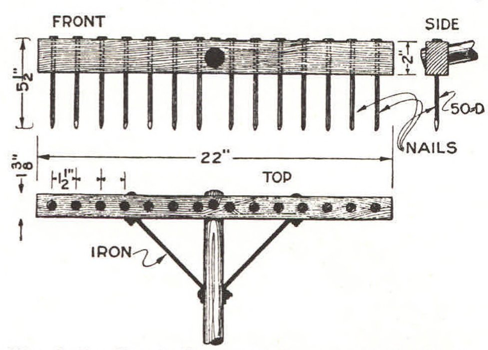


When Clamping Three Pieces of Material, the Piece in the Middle is Prevented from Sliding Out by the Adjustment of the Central Screw

frequently necessary in pattern making, a three-way clamp, as illustrated, is a most convenient tool. Such a clamp is not difficult to make if one is able to obtain two old single-screw clamps which may be dismantled to secure the desired screws. The arms are of cold-rolled stock, while the fittings may be of any grade of steel soft enough to be readily worked. The joint A is the most difficult part to make, hence for the sake of clearness, a detail of it is shown in the sketch. No dimensions are given, as these must be determined by one's requirements.

Serviceable Garden Rake Has Spike Teeth

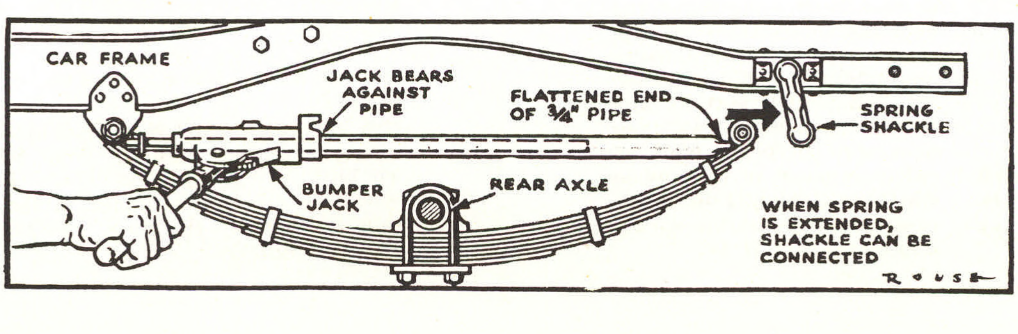
Prices of garden tools, like those of most manufactured articles, have advanced until much of the profit is cut from the home garden if they have to be purchased. The rake, one of the most essential implements, is one that is easily constructed in the home shop, and if made as indicated in the sketch, is quite as satisfactory as any commercial article. The head and handle should be of oak, or any clear, hard wood. A piece of round material suitable for the handle may be obtained at any planing mill for a nominal sum. The teeth, 14 in number, are 50-penny spikes. The holes for them, drilled in the head, are slightly smaller than the nails themselves, to insure a tight fit. The teeth are further secured by applying white lead in the holes before the nails are driven in. The handle braces may be of any soft strap iron. These are heated slightly for bending, and are bolted in place with three carriage bolts. The handle is given a driven fit into the head, and is held by



The Spike-Tooth Garden Rake may be Built at a Fraction of the Cost of the Commercial Article, and Is Fully as Serviceable

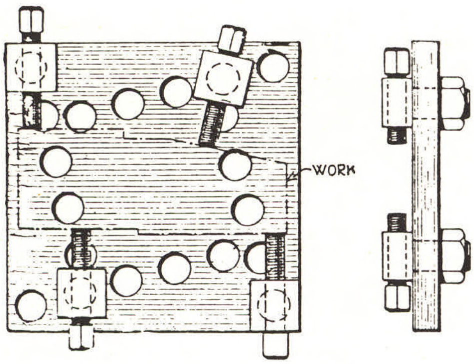
a nail driven through and sawed off flush with the underside of the head. —A. P. Prentice, Trenton, N. J.

EXPANDING A SPRING may be done with a bumper jack and a piece of ¾" pipe flattened at one end. Rest the jack base and the pipe against the ends of the spring and work the jack until the shackle bolt can be inserted.—N. S. BEEBE.



How to Make a Clamp for Odd Shapes

WHERE odd-shaped pieces have to be held for any purpose, such as gluing, the clamp here illustrated is useful, and it is obvious that it can be made in various forms. The dimensions may be varied according to the

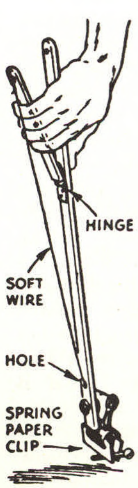


With this clamp a piece of any shape can be securely held

needs of the mechanic, so no dimensions are here given. For a base use a piece of stiff cold-rolled steel plate.

Drill in it a number of holes just large enough to take sawed-off bolts. These bolts must be threaded right down to the heads and cut off so that there will be just enough of the threaded shank projecting to take the nut. Drill the heads for screws as large as can be accommodated, and tap them. Screws of various lengths can be used, and the bolts can be shifted about from hole to hole, according to the nature of the work to be held.

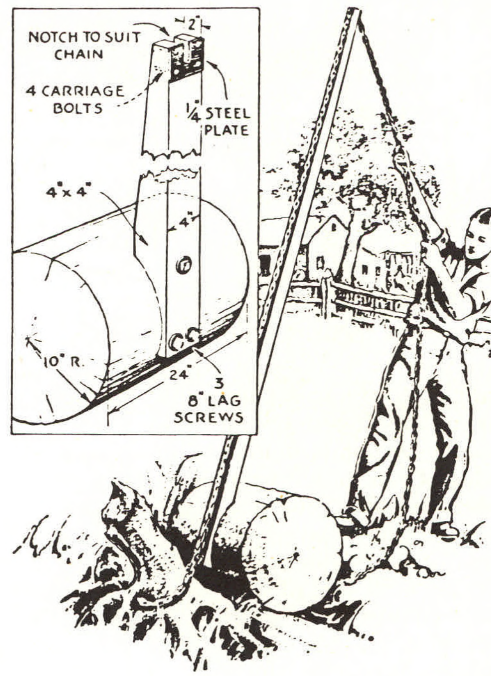
Pick-Up Retrieves Small Lost Parts



A LIGHTWEIGHT pick-up for small articles that fall on the floor and roll under the workbench can be made as shown from a steel spring clip of the type sold in stationery stores, a short piece of soft wire, a small hinge, and two sticks. The main stick may be any length desired; it is then necessary that the wire be fastened so it is taut when the hinged handle is in an open position and the spring clip closed.—C. H. W.

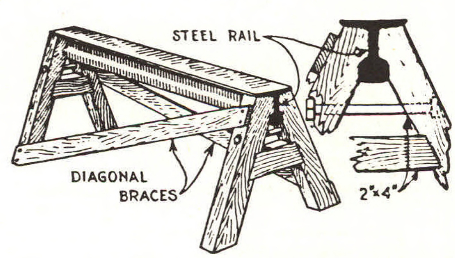
Small Stumps Removed with Homemade Puller

ALTHOUGH costing very little, this stump puller will be found useful for small stumps. A chain with a hook on one end is passed around the stump close to the ground and hooked on the side next to the puller. With the spar vertical and the puller close to the stump, hook the chain in the steel plate at the top of the spar and apply power at the loose end of the chain by hand or with a car or truck.—KENNETH L. KNULL.



Steel Rail Serves as Useful Straightening Fixture

A FOUR- or 5-ft. length of steel rail, mounted on trestle legs, as shown, serves as a useful straightening fixture.

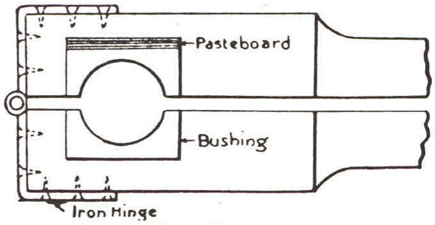


Heavy legs like those of a sawhorse support the steel rail

The legs are made from two-by-fours, strongly crossed, braced, and bolted. It will be noted that there is no necessity for drilling holes in the rail, and the fixture, therefore, can be put together quickly.

A CONVENIENT POLISHING-CLAMP

A polishing-clamp which would be hard to improve upon in point of convenient features was contrived by a correspondent of the American Machinist. The jaws or levers of the clamp are cut out so that a square block of standard size fits in snugly. Instead of boring a hole in the levers which would fit but one size of shaft, the hole is bored in the square block, and other blocks having different-sized holes may be fitted in as required. In this way if a hole becomes so worn as to be unfit for further use the block may be discarded and a new one provided, or pieces of cardboard may be packed in between the bushing and the lever until the levers are held as far apart as they were in the first place, whereas without the blocks the whole clamp would have to be discarded.



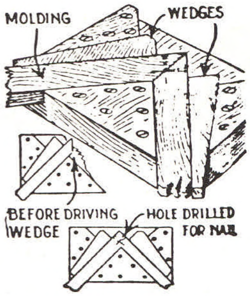
A Polishing-Clamp Improved

Another good feature of this clamp is the manner in which the levers are joined. Instead of a strip of leather tacked to the wood, an ordinary iron hinge is used, the ends of which are bent to conform to the shape of the lever ends.

Simple Wooden Vise Aids in Joining Picture Frames

THREE blocks screwed to a base block or the bench, as shown, form a substantial and quickly made picture frame vise for the home workshop. Two wedges are used to clamp moldings of various sizes in the vise.

Every precaution must be taken to have the face angles of the inside block just 90 degrees, and all bearing surfaces of blocks and wedges should be planed at right angles to their sides, as otherwise the wedges will not hold well and the moldings may not lie flat. All the parts should be made of a hard wood such as maple or oak, and plenty of screws used.



Wedges hold the molding in place for nailing

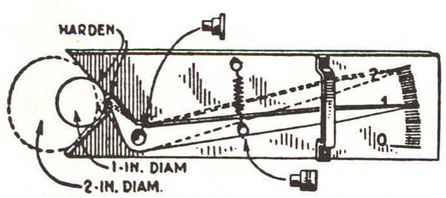
In placing the molding in the vise, a slight allowance should be made for the tendency of the wedge to carry the molding along with it as it is driven home. Then, when the pieces are clamped, a hole should be drilled through each piece and started into the other piece, the holes being slightly smaller than the brads or nails that are to be used.

Any one who has struggled to nail a mitered frame in an ordinary vise will appreciate this simple fixture.—ROBERT N. STANNARD, Eltingville, N. Y.

Measuring Diameters with a Self-Registering Indicator

CALIPERS and a scale are used ordinarily for measuring the diameter of shafts unless a micrometer large enough for the purpose is at hand.

The caliper method is slow and the micrometer method is useful only for stationary shafts. As a substitute, the tool illustrated will measure quickly either a revolving or stationary shaft or circular part.



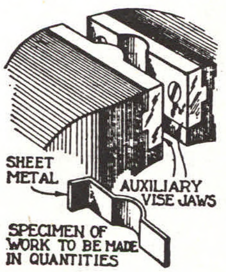
Either stationary or revolving shafts or cylindrical parts can be measured with this gage

A 90-degree V groove is cut at one end of a steel plate and an indicator is pivoted as shown, to bring the head near the center of the notch. The long arm of the indicator registers opposite a scale, which is calibrated by standard plug gages. The contact faces should be hardened.—G. A.

Vise Jaws Serve for Bending Small Duplicate Parts

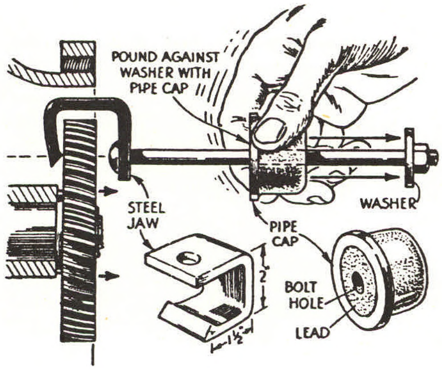
BENDING operations can be done with a bench vise when only small lots are required and the expense of making dies is not warranted, or in small jobbing shops where better facilities are not available. Auxiliary vise jaws are made for bending the piece and are substituted for the regular vise jaws. They may be made of tool or machine steel, depending upon the character of the work.

Many intricate bends can be made in sheet metal. Holes can be punched where they are needed by adding punches to the dies. While this method is slow, it is economical in many cases when exact duplicates are required of pieces such as the one shown.—H. L. WHEELER.



Auxiliary bending jaws fitted to vise.

Pulling Tool Has Self-Contained Hammer



ORIGINALLY designed to pull off timing gears, this homemade tool worked so well that it has a permanent place among my hand tools. It can be used for removing gears, axles, sticking valves, bearing caps, cylinder heads, grease retainers, and other parts, especially the pitman arms on steering assemblies.

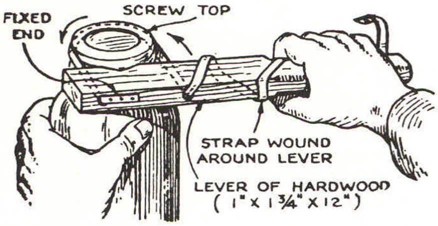
The tool consists of a 10-in. carriage bolt, nut, and washer, a 2-in. pipe cap filled with lead and drilled through the center, and a jaw. The latter can be of strap iron, but is best made from an old auto spring by utilizing the center hole already in the spring.

The jaw should be shaped while a salmon red. The "bite" is formed by upsetting the edge with a heavy hammer, and it is then filed sharp while the metal is still red-hot. The entire piece is brought to a uniform cherry red and quenched, when purple, in cold water until black. It is allowed to finish cooling slowly, thus slightly annealing it.

In use, the jaw is hooked over the part to be removed, and sharp blows are struck with the weight until it becomes loose.—T. W. BOYD.

STRAP WRENCH REMOVES STUBBORN JAR CAPS

THE screw covers of canning jars are frequently so hard to turn that some sort of wrench must be used to start them. Such a wrench may be made as shown from a piece of hardwood such as maple or oak, 1 by 1¾ by 12 in. Bore two ⅜-in. holes, shape the handle as suggested, round the corners to save the hands, and make the V-notch. Pass a piece of ½-in. raw-



Hard-to-open canning jar caps yield quickly to this easily constructed adjustable wrench

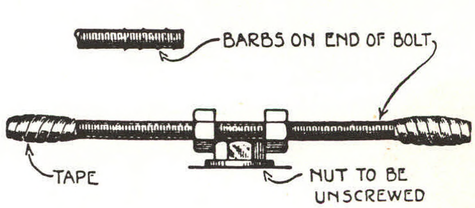
hide 30 in. long or a strap or piece of stout cord through the holes and fasten as shown. In use, place the screw top in the loop, draw the strap tight, and hold it from slipping by grasping it and the handle firmly. Hold the jar so it can not turn and apply enough force to start the cover, after which it may be easily turned off by hand. Always arrange the strap wrench so that the turning of the cap tends to put the tension on the fixed end of the rawhide, strap, or cord.—C. A. K.

This Emergency Wrench Is Also a Useful Tool

HERE is an emergency wrench that is useful as well as ornamental.

If possible, procure a bolt or steel rod which is threaded at least a foot along its length. Then run on two square nuts, fairly tight fit.

At each end of the bolt, cut it up with little barbs with a cold chisel



The long handles of this peculiar wrench permit the operator to turn the nut with ease

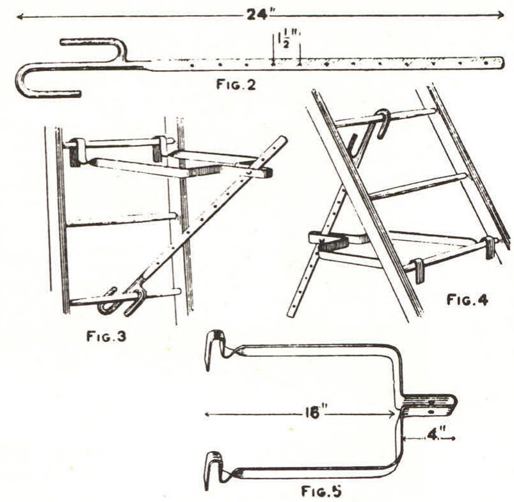
and hammer. Then wrap each end thus scarred with several turns of electricians' tape so as to cover the barbs well and make a smooth handle.

By closing the nuts upon the sides of the nut it is desired to turn, and grasping the handles in each hand, this tool will be found to make a very serviceable wrench.—T. HALLETT.

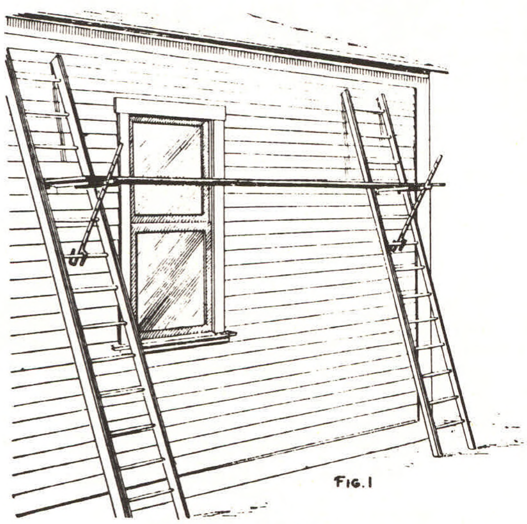
Ladder Attachments for Making a Scaffold

Painters who work on frame houses and do not have a swinging stage will find the ladder jacks shown in Fig. 1 a great help.

Each jack is made of 3/8-in. iron in two separate parts, the brace, Fig. 2, and the staging support, Fig. 5. These parts can be adjusted to any angle by taking out the bolt and raising or lowering the staging support to the desired position. The jacks are hooked on the rungs of the ladder as shown in Fig. 3. This is the usual position, but they can be reversed and used on the back of the ladders as shown in Fig. 4. For small places on the sides of buildings, sign work, etc., this jack will be found very useful.—Contributed by W. B. Smith, Guelph, Ontario.



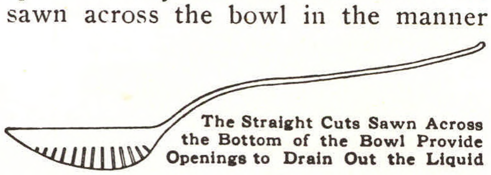
Parts to Make the Jack



The Scaffold in Use

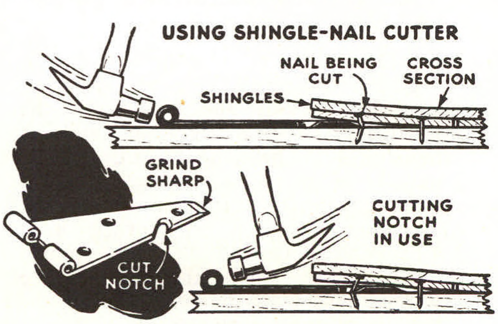
A Skimming Spoon

A handy skimming spoon can be made very quickly of an ordinary spoon of any size desired. Slits are sawn across the bowl in the manner shown, using a hacksaw. The illustration is self-explanatory.—Contributed by G. H. Holter, Jasper, Minn.


The Straight Cuts Sawn Across the Bottom of the Bowl Provide Openings to Drain Out the Liquid

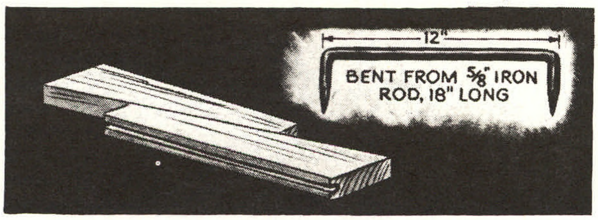
Strap Hinge Cuts Shingle Nails

WHEN shingle nails interfere with the insertion of a new valley under the edge of roofing, they can be cut off with a long, sharpened strap hinge. A notch cut in the side of the hinge and then ground to an edge, as indicated in the drawing below, will catch nails that are missed when the hinge is driven in.—FRANCIS MANLEY.



Staple Bent from Heavy Rod Aids in Laying Warped Tongue-and-Groove Flooring

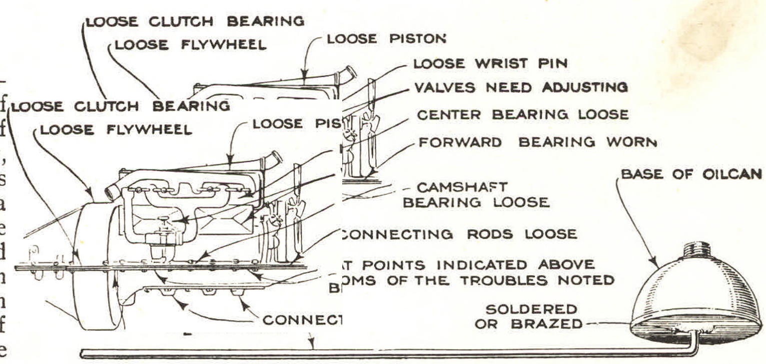
WHEN the proper facilities are not at hand for laying tongue-and-groove flooring, some sort of wedging method is frequently used to set the pieces up tight. These wedges can be held with a double-pointed iron rod as shown. If a few holes in the joists or rough flooring are not objected to, the most obstinate piece of flooring can be forced into place. The groove is left on one of the wedges, which are cut from a scrap of flooring.—R. S. MACNEILL.



The staple is driven temporarily into the rough flooring or joists to give a firm bearing for a pair of wedges

Homemade Knock Detector or Stethoscope

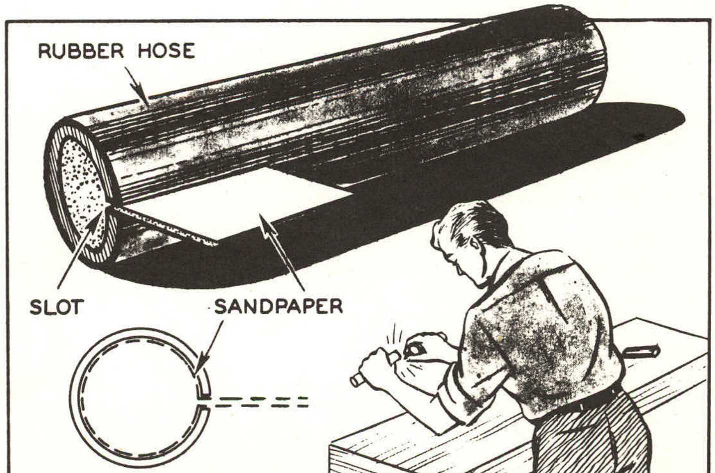
An improved and effective knock stethoscope, for detecting the location of knocks due to wear and looseness of bearings and moving parts of machinery, particularly of automobile engines, is made from an ordinary oilcan and a length of steel rod. As shown in the drawing, the steel rod is bent at one end and soldered, or brazed, to the bottom of the oilcan, and the spout of the can is removed. In use, the threaded collar of the oilcan is applied to the ear and the end of the rod is placed against the engine at the points indicated, to detect any of the various irregularities common to internal-combustion automobile engines.



The Stethoscopic Principle of Magnifying Sound is Used for Detecting Knocks, and Other Irregularities, Common to Internal-Combustion Engines

Simple Cleaner Made From Hose

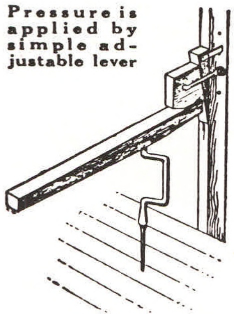
A SIMPLE device for cleaning battery terminals or anything round, can be made quickly and easily from a short piece of rubber hose and a sheet of sandpaper. A slot is cut in the hose and the sandpaper is placed around the inside with the ends protruding through the slots. The hose then is slipped over the object to be cleaned and rapidly rotated.



Rig Makes Light Work of Drilling and Boring by Hand

By Henry S. Laraby

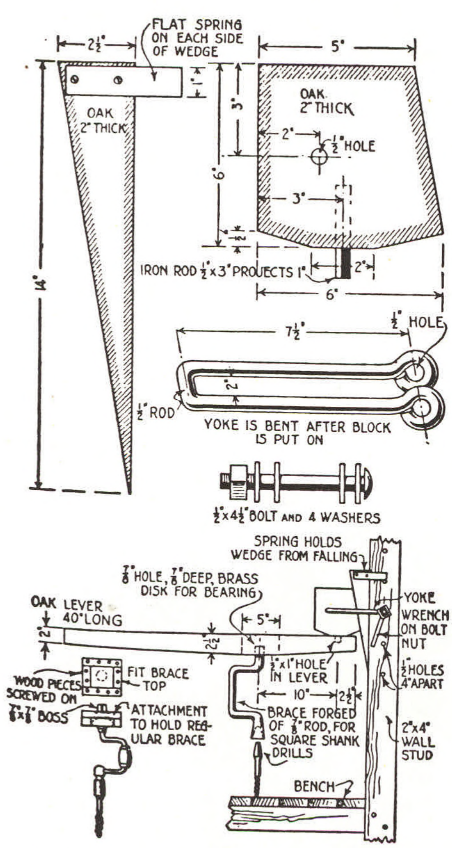
WHENEVER heavy drilling or boring is to be done in the home workshop and no machine is available, much labor may be saved by constructing a drill rig like the one illustrated. It is easily adjusted, has few parts, is very strong, and takes up no room when not in use. Either a regular hand brace can be used in connection with it, or a brace may be forged from a ⅞-in. rod.



Pressure is applied by simple adjustable lever

Pressure is obtained by means of a lever of oak or other hard wood, 40 in. long. The fixed end is fastened to a wall stud or a "two by four" at the back of the bench by means of a block, yoke, and wedge, which are adjustable as to height. The block has a lug, which engages a hole in the end of the lever and in the under side of the lever is a bearing for the brace.

Ample adjustment is provided for boring work of various sizes because the holes for the yoke are 4 in. apart and the wedge permits any adjustment within 4 in. A sawhorse can be used in place of the bench. In fact, if the ½-in. holes in the stud are run from the floor up at 4-in. intervals, any working height may be obtained. In operation, the lever is pressed down under the left arm and the right arm is used to turn the brace.

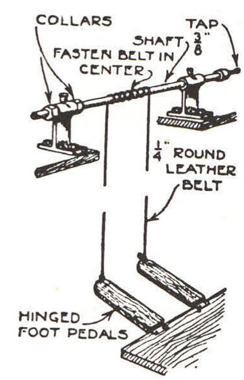


How the parts of the heavy boring rig are made and assembled

How to Make a Foot-Power Reversing Tap

WHEN there are a large number of small parts, such as small die castings or punchings, to be tapped and threaded, and they do not require more than 5 or 6 threads, the arrangement shown in the illustration may be successfully used if a reversing power tap is not available.

A shaft is mounted upon two bearings and a hole cut through the bench to allow two small belts to run down to the two foot pedals. The tap is mounted on the end of the shaft in a chuck or other suitable holder. In operation, the piece is held to the tap, and one pedal is pressed. This causes the shaft to revolve, thereby tapping the hole. Then the other pedal is pressed and the shaft makes the required number of revolutions in the opposite direction to run the tap out again.—VICTOR H. TODD.



One pedal runs the tap into the hole, the other revolves it out again

Handy Gauge for Drilling

ON MY workbench I keep an ordinary 12-in. hardwood rule along the middle of which are holes ranging from 1/32 to 5/16 in. The size of each is marked with India ink. When I have to bore a hole to suit a certain bolt, rivet, pin, or screw, I try the fastening in several of the holes until I find the size it fits, and then select a drill.—R. J. JARVIS.

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100 Years of Homemade TOYS 1850–1950

Indoor/outdoor, summer/winter, individual/group toys & games to make and use. Some, like the outdoor merry-go-round, are major projects. Paper airplanes & doll furniture & Indian stick games are easy and quick. Materials vary from wood & metal to found-objects & paper; power is provided by the child or by mechanical devices like rubber bands. As well as providing plans and instructions for making these toys, the articles are a fascinating insight into periods when most toys were homemade

To be published in 1981

Early Alternate Energy

Many of the 'modern breakthroughs' in alternate energy were actually developed between 1800 & 1920 and used on a limited scale during that period. Some of the ideas in these articles have never been rediscovered. Most are projects with plans and instructions. Topics covered are windmills (unusual solutions), water power, solar heating, solar power, and other little known technologies. This is convincing evidence that the most innovative ideas cannot become truly revolutionary until they are widely accepted.

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Volume 2: An index of laws, rules, & formulas for basic applied physics. Mechanical and electrical problems involving voltage, gas pressures, leverage, mechanical motion, gear ratios and other relationships are cross-indexed with volume 1 for quick reference.

To be published in 1981

Metal Craft

Many rarely-seen techniques for creative metal working: casting, spinning, etching, inlay, cutting and other processes for jewelry & crafts.

to be announced

Repairing & Sharpening Tools

New (and old) ideas for tricky repair problems. Replacing wooden & metal handles; adjusting scissors & pliers; sharpening scissors, saws, & chisels; regrinding; hints for some special power tool problems are a few of the topics. This book helps you tell when your tools are not working to full capacity & what to do about it.

to be announced

Use and Care of Hand Tools

How to use and care for hand tools, and how to use these tools in ways that they were not designed for and get by with it.

to be announced

The Amateur Mechanics of 1900

2 Volumes

An amazing collection of home and scientific projects of every kind from the turn of the century (1900–1912). The material is from *Boy Mechanic* and other books of the period. Some of the projects are only for boys with 20 years experience inventing and constructing.

to be announced

Painting & Refinishing

1900–1950

Hints, formulas, & techniques for house painting; refinishing or restoring antiques; using varnish, oil, paint, stain, & other finishes. Includes a fascinating section on mirror making and resilvering, handling & cutting glass.

to be announced

Making Early Paints and Varnishes

These recipes for paints, varnishes, and color additives originated before 1850. All are simple to mix, although the more exotic shellacs and varnishes need harder-to-find ingredients. These are materials for interior & exterior, furniture and housing.

to be announced

Using a Wood Turning Lathe

A basic instruction manual on learning to use a wood lathe with additional material on lathe maintenance, tricks, accessories, and jigs to make.

to be announced

Neat Things

Incredible natural events, amazing inventions & possibilities never investigated or developed. Some of these happenings are strange, some are hilarious, and some have such potential that you will be enraged that no one possessed enough creative vision to use them.

to be published early 1982

Welding & Soldering

You will be amazed at how they did it before arc welding & electric soldering irons. Dating from 1890 to 1950, this material ranges from early charcoal-forge welding to plans for home-built natural gas and acetylene arc welders.

to be announced

Metal Hardening & Tempering

How to temper tools and parts, including information on testing hardness. Covers simple and complex as well as construction of furnaces and other equipment for oil, chemical, and heat tempering of a variety of metals.

to be announced

Wood

2 volumes

A collection of articles on information about wood: characteristics; purchasing; relationship & equivalency between one type of wood and another; and techniques for appropriate use, bending, shaping, preserving & curing of different woods. Guaranteed to keep a wood lover busy for a long time.

to be announced

Old Time Kitchen Chemistry

1800–1950

Formulas and projects in home chemistry for use around home, farm, & business. Cosmetics, cleaning compounds, insecticides, perfumes, animal treatments, polishes, dyes & dressings are among the recipes in this book, all edited to remove outmoded solutions.

to be announced

Magic Tricks

1890–1950

Ranging from simple illusions using no props to complicated stagings. Many of these tricks are not currently available. Includes card, coin, spectacle and illusion. Compiled in cooperation with a practicing magician. For all ages.

to be announced

How to use power tools

Tricks of the trade include standard problem-solving techniques as well as alternate & time-saving solutions for power tool projects. Mostly for wood working, some metal. No matter what experience you have had as a tool user, some of these solutions will amaze you.

to be announced

Home Built Power Tools

More than 100 power tools to build or improvise plus 200 jigs and accessories for your home-built tools or for currently available commercial tools. Some of these projects can do jobs for which no commercial tools are available. For both wood and metal.

to be announced